Agenda

Bond Reimbursement and Grant Review Committee Meeting Agenda

May 2, 2017~~April 25, 2017~~
2:30 pm to 4:00 pm~~1:30 pm to 3:00~~ pm

Teleconference – School Finance Conf. Room
801 W. 10th Street
Juneau, Alaska

Chair: Heidi Teshner, Chair

Tuesday, May 2, 2017

Agenda Topics

2:30-2:35 PM

Committee Preparation
- **Call-in, Roll Call, Introductions**
- **Chair's Opening Remarks**
- **Agenda Review/Approval**
- **Past Meeting Minutes Review/Approval**

2:35 – 3:15 PM

Department Briefing
- **Construction Standards Efforts**
  - **Construction Standards Subcommittee**
  - **Draft Publications and Formats**
- **Construction Standards & Cost Control Elements**
  - **Model Alaskan School**
  - **Cost Standards**
  - **Commissioning**
  - **Materials/Systems Analysis**
  - **Design Ratios**
  - **Value Analysis**
  - **Construction**

3:15-3:45 PM

Construction Standards for Cost-effective Construction – [(b)(3)] Strategy
- **Proposals & Discussion**
- **BR&GR 2017 Workplan Review**
- **Assignments & Scheduling**

3:45 – 3:50 PM

DEED Wrap-up

3:50 – 4:00 PM

Committee Member Comments

4:00 PM

Adjourn

Audio Teleconference: Call Toll-Free 1-855-244-8681 (US/Canada); Meeting Number 807 813 709

Agenda

Bond Reimbursement and Grant Review Committee Meeting Agenda

April 25, 2017
1:30 pm to 3:00 pm

Teleconference – School Finance Conf. Room
801 W. 10th Street
Juneau, Alaska

Chair: Heidi Teshner, Chair

Tuesday, April 25, 2017

Agenda Topics

1:30-1:35 PM

Committee Preparation
- **Call-in, Roll Call, Introductions**
- **Chair's Opening Remarks**
- **Agenda Review/Approval**
- **Past Meeting Minutes Review/Approval**

1:35 – 2:15 PM

Department Briefing
- **Construction Standards Efforts**
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- **Construction Standards & Cost Control Elements**
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DEED Wrap-up

2:50 – 3:00 PM

Committee Member Comments

3:00 PM

Adjourn

Audio Teleconference: Call Toll-Free 1-855-244-8681 (US/Canada); Meeting Number 807 813 709

BOND REIMBURSEMENT & GRANT REVIEW COMMITTEE
March 30, 2017
Teleconference
FOR REVIEW & APPROVAL - MEETING MINUTES

Committee Members Present	Staff	Additional Participants
Heidi Teshner	Tim Mearig	(None – Committee Work Session)
Rep. Sam Kito III	Lori Weed	
Sen. Anna MacKinnon		
Mark Langberg		
Dale Smythe		
Robert "Bob" Tucker		
William "Bill" Murdock		
Doug Crevensten		
Don Hiley		

CALL TO ORDER and ROLL CALL at 1:32pm

Heidi Teshner, chair, called the meeting to order at 1:32 p.m. Roll call of members: Bob Tucker is absent; Sen. MacKinnon and Rep. Kito are excused. Quorum of 6 members.

REVIEW and APPROVAL of AGENDA

Sen. MacKinnon joined the meeting.

Agenda reviewed and approved by unanimous consent.

REVIEW and APPROVAL of MINUTES

Bob Tucker joined the meeting.

Minutes for February 28, 2017 reviewed and approved as submitted by unanimous consent.

BR&GR MASTER LIST WORK PLAN

Tim noted that this is a carryover from the February 28 meeting. The department would like to bring back a process for long-range and annual planning for the committee. This specific tool was previously used through 2006. The work topics have been organized by statutory responsibilities; the list includes items from 2006 and those noted by the committee more recently.

Rep. Kito joined the meeting. (Full complement of 9 members.)

Tim offered that the document is a work in process and anticipates DEED to have a supporting role. Bob noted that some items have been on the list for quite some time and suggested a brief synopsis of each item and a determination of which topics should remain on the list and those that are not relevant. Tim concurred but observed that some items, such as the space allocation issues, are so old as to be current again. The document should be edited to be a useful tool for tracking topics, and look at responsibilities and due dates.

Tim reviewed the first section, noting the committee is tasked with putting forward an application for ranking projects. The committee was created in SLA 1993, it established the application and prioritization process for FY96, and has since been responsible for annually approving an application for the major maintenance and school construction grant fund process.

Under section 2, the statute asks the committee to review projects. Reference the February 28 meeting, discussing committee options to review projects and make recommendations. This section includes items relating to how the committee can help the department plan school construction and renewal around the state, including a related topic on funding.

Responding to Sen. MacKinnon's question, Tim clarified the work item "state's role in design and construction" has been on the list as a discussion item as to whether or not the department can have different levels of involvement between rural and organized boroughs, as many municipalities are recognized jurisdictions for code reviews. DEED has implemented regulations as a result of this work topic to enable districts to enter into a memorandum of agreement to do their own design reviews and the department primarily reviews scoping and bidding documents. Bob clarified that the committee does not participate in these arrangements. Tim indicated that the committee had likely been involved in drafting the regulation.

Sen. MacKinnon noted that the state suspended the debt reimbursement program and she has currently introduced a bill (SB 87) to try to gain energy efficiencies for long-term operating costs. She is very interested in the role the committee plays in developing regulations around energy efficiency, construction management, and design and construction.

Section 3 relates to developing criteria for cost-effective school construction. Several items have been implemented in this area, but the committee has not produced a document or standards. Tim observed that this section is a resource intensive effort, and is hard to do on a volunteer basis.

Section 4 is prototypical design analysis. The committee has attended to this previously, adopting prototypical school design guidelines. There was a 2015 prototype analysis report.

The annual topic in Section 5 is the drafting and approval of the project application. Included in that is the committee's responsibility for a ranking system. Related to the area of CIP application and scoring, there is an opportunity to touch on many aspects of school planning, design, and construction. [Note: on reaching this section, Tim modified that Section 1's emphasis was mis-stated and should have been the committee's review of grant priorities.]

Section 6, "CIP Approval Process Recommendations", is based on statutory requirement for recommendations to the state board on making changes to the approval process for grants. The work topics documents have traditionally included regulations and handbooks in this section.

Section 7 was added in 2010, relating to setting standards for energy efficiencies for schools for construction and major maintenance; the committee addressed this in 2011-2012, recommending DEED implement standards in regulation.

Tim asked whether any committee member could speak to 6.5.1, 6.5.2, or 6.5.3. Don stated that 6.5.3 ("ADM by Grade Level (for SERRC?)") came from trying to do enrollment projections based on cohort survival worksheets. Rep. Kito clarified that 6.5.1 (Consolidation into Single Database) was based on DEED having multiple databases and spreadsheets being copied forward every year in support of the CIP process, and looking at whether those could be combined. Item 6.5.2 (Coordination with Unity Project) was DEED looking into whether it would be useful to integrate with the U.S. DOE database. Lack of staff and resources prohibited looking into these issues. Tim stated that the department will conduct an internal review of these two topics.

Sen. MacKinnon suggested that work on *School Design & Construction Standards* not wait until 2020 as currently listed. If the school debt reimbursement program returns in 2020, it would be beneficial for the committee to take up school design and construction standards to support the legislature as it looks at what to do with school construction and major maintenance. Committee agreed to revise the publication timeline.

In response to Mark's suggestion to retire the *Swimming Pool Guidelines*, Tim clarified that the publication does not provide design standards but is based on statutory requirement to provide districts information on allowable pool size and when they would qualify for a state-funded pool. Rep. Kito also observed that if the lower level of the debt reimbursement program were not reinstated, the *Guidelines* would need to be revised and statute would need to be reviewed.

BR&GR 2017 WORK PLAN

Committee members reiterated their desire to move the *Construction Standards* to the 2017 work plan. Tim stated that it would be helpful to remove the *Life Cycle Cost Analysis* and replace it with the *Construction Standards* publication. Sen. MacKinnon noted that any changes to the process, in order to introduce or modify existing legislation, would be needed by January 2018.

Tim suggested that the committee schedule another short teleconference session prior to the September meeting; he can provide an overview of the publication status. Mark suggested that the committee plan on several telephonic meetings prior to September. Tim noted that one or more subcommittees to work on the publication may be needed. General concurrence for a preliminary meeting to frame the topic, followed by a few longer efforts on the publication.

Mark noted there were no surprises in the prototype report and recommended removal.
Sen. MacKinnon summarized the report's finding not use prototypical designs, noting, however, the bill she introduced that addresses standardized components for various systems by climate region. Bob asked that DEED send the committee the legislation under consideration.

Tim noted that SB 87 includes a provision for the committee to review school plans for the potential application of standardized systems and components. He will reach out to committee members to work on position paper for the September meeting on how to take on that role if the bill is passed. Bob offered to collaborate as needed. Discussion on procurement rules, ability to sole source materials and equipment, and limiting contractor mobilization/ de-mobilization costs.

FUTURE MEETING DATE

Heidi stated that the next meeting date and time will be discussed via e-mail. She asked for approval for 2017 work topic plan changes: remove prototype report review, add briefing paper on the pending legislation (SB 87), remove *Life Cycle Cost Analysis Handbook* update, and add new *Construction Standards* publication. Committee approved by unanimous consent.

CLOSING COMMENTS

Committee members expressed support of shorter telephonic "work sessions" in-between regular bi-annual meetings and appreciation that the full membership was able to attend and participate.

MEETING ADJOURNED

The committee adjourned at 2:48 p.m.

State of Alaska **Department of Education & Early Development**
Bond Reimbursement & Grant Review Committee

By: Tim Mearig, Facilities Manager **Date:** April 17, 2017

Phone: 465-6906 **File:** g:\br&gr\papers
Construction Standards

For: Bond Reimbursement and Grant Review Committee **Subject:** School Construction Standards Efforts

B R I E F I N G P A P E R

Background

AS 14.11.013(b)(3) tasks the Bond Reimbursement & Grant Review Committee with the development of criteria for school construction as follows:

> *(3) develop criteria for construction of schools in the state; criteria developed under this paragraph must include requirements intended to achieve cost-effective school construction;*

Upon formation in September 1993, the Committee began efforts to accomplish this task. The first meeting's agenda included one and a quarter hours for discussing "Guidelines and Standards". For the next five years—through 1999—the Committee's actions in this area addressed the mandate indirectly through the review and update of existing standards, and the adoption of several general strategies including: 1) requirements for life cycle cost analysis and cost/benefit analysis to supplement CIP applications, 2) development of Alaska-specific school facility appraisals, 3) regulations adding national standards and codes for school facilities, and 4) development of policy on prototypes.

In 2000, a Construction Standards Subcommittee was formed under the leadership of Harley Hightower, an original appointee to the Committee in one of the two *Professional Degree & Experience in School Construction* positions. By December of 2000, the record shows that Harley had concluded that, due to the complexity of the issue, additional assistance beyond what he could individually supply to the committee would be needed. He gained the Committee's concurrence to solicit assistance from other entities such as the AIA, CEFPI (now A4LE), and APDC. He also requested that the department gather all standards/design guides from districts for use in the effort.

During 2001 and 2002, a revolving group of experts was assembled by Harley, and the subcommittee had substantial activity including a series of a dozen meetings to review progress and align efforts. A mission statement was adopted and frameworks for the standards were reviewed and approved by the Committee (see attached).

Available records indicate sustained efforts by subcommittee members, and regular reporting to the Committee through the fall of 2002. However, very little tangible product, if produced, remains and the subcommittee disbanded that December.

Discussion

Sample Publications & Formats

One important reality surfaces from review of the subcommittee-era efforts. Throughout, there was a running tension regarding the proper format for a state-level construction standard: should it be a set of performance standards organized by building system, or should it establish prescriptive standards organized by construction trades and materials?

After the subcommittee dissolved, two of its primary advocates, Nathan Coffee, Architect Assistant at DEED, and Harley Hightower, each continued to pursue their vision of a school construction standard. In 2004, just prior to leaving the department for other opportunities, Nathan completed a draft DEED publication, *School Design & Construction Standards Handbook*—a 12 page narrative standard incorporating various design criteria. In early 2005, in a herculean effort, Harley provided the department with a collection of 36 standards sections covering most architectural components. As presented, this is a 287 page document complete with industry standards, materials properties, and performance and installation requirements. In previous testimony to the Committee, Harley stated that a complete set of standards of this nature covering site civil, architectural, mechanical, and electrical construction elements would require 100 sections.

Also included in supporting material are two samples of school facility standards, one from the Mat-Su Borough School District, and one from the Lower Kuskokwim School District. We estimate that similar standards are in-place in approximately 50% of the school districts in the state.

Construction Standards & Cost Control Elements

In developing criteria for school construction in the state there are many possible areas of focus. Indeed, the state has well-implemented standards in the following areas:

- standard building codes (4 AAC 31.014),
- energy efficiency codes (4 AAC 31.014),
- eligible space per attendance area (4 AAC 31.016),
- eligible space per student (4 AAC 31.020),
- eligible covered areas (4 AAC 31.020),
- construction project execution (4 AAC 31.023), and
- construction project procurement (4 AAC 31.080).

Although each of these standards can significantly impact the cost of school construction, none of them establishes a standard for achieving cost effective school construction. Said another way, none of them implement restrictions on either excessively high cost or ineffectively low

cost. Two projects, in the same geographic region, each firmly adhering to codes, eligible space, and project delivery requirements could be completed with widely varying total project costs. Currently, the state has authority, through several statutory and regulatory provisions, and opportunity, through project review and analysis, to mitigate this cost differential. While every effort is made to apply cost adjustments in a clear, even-handed manner, there is no published standard for assessing cost effectiveness.

Following are some possible construction standards elements that have a cost control component:

1. *Model Alaskan School*

The premise of this standard would be to establish what features and elements of a school would be eligible for state aid and beyond which, according to their preference or an alternate standard, would need to be funded 100% by the local education agency. Since the publication of the *Program Demand Cost Model for Alaskan Schools* in 1980, and its subsequent updates through the 16th Edition, the department has had a de facto standard of a Model Alaskan School. Currently this model is Anchorage-centric but it could be developed to incorporate the necessary geographic regions of the state. An extraction of the current model school elements is attached.

2. *Construction Cost Standards*

The premise of this standard would be to establish a maximum cost, presumably on a dollar per square foot basis, which would be eligible for state aid. Beyond this maximum, cost for the project would need to be funded 100% by the local education agency. Again, using the *Program Demand Cost Model for Alaska Schools*, the department effectively manages a cost standard applicable to many school projects. By applying geographic cost factors to the model school, a reasonable cost for school capital projects can be created for every school location in the state. To date, the Cost Model has only been used as a check-and-balance for estimated project costs, not as a maximum cost tool. Several US states currently manage either a maximum cost or a cost range for projects receiving state aid. In discussions with counterparts in those states, each admit that it is very challenging to manage this standard. Here is a partial list of reasons: a) costs change constantly, b) construction costs include variables that, even for contractors, are best guesses, c) projects are often a hybrid of types (i.e., new construction, addition, system/component repair, system/component replacement, system/component upgrade, etc.) each of which influences costs differently, d) even when new construction for buildings can be normed, site costs are widely variable.

3. *Materials/Systems Standards*

The premise of this standard would be to establish, after a review of available options, those building systems and components which are the most cost effective for deployment in school construction in Alaska. The benefits of such standards would be to exclude inappropriate solutions from a cost, performance, or other basis. Often these types of standards are very specific and grow out of real-world experiences and/or case studies which can then be applied to other situations. In addition, standardization of this type can lead to savings in a production-oriented environment where a measured, known outcome is desired to be repeated. The nemeses of these types of standards is variation. As an example, exhaust ventilation systems are required by code for occupant health and safety. This could suggest the development of a standard exhaust fan with the best life cycle cost effectiveness. However, exhaust system sizing normally

incorporates factors such as the number of occupants and the volume of the air (enclosed space) being exhausted. If these variables become difficult to control or to replicate, standardization becomes more challenging. Where variation can be controlled without introducing unintended consequences, materials/systems standards can be effective.

4. Design Ratios

The premise of standards based on ratios comparing one or more related elements is that a 'sweet spot' or range can be identified for the most cost effective relationship. In geometry we find the example of a sphere where the ratio of volume to surface area is maximized. Applied to building construction—where spheres have yet to be proven as particularly functional or cost effective—a 1000sf building that is 10ft x 100ft x 20ft high may have the identical roof and floor area as one that is 31.6ft x 31.6ft x 20ft but the surface area ratio of the enclosing walls to the floor in the first building is 4.4:1, but only 2.5:1 in the second. Design ratios are a common tool in today's energy standards where lighting systems must meet a specified power density in watts/sf, or windows are indexed to a percentage of the exterior wall area. While design ratios can be very effective measures of efficiency, the result of an efficient ratio in one measure can be offset by decreased efficiencies in another. In the building example above, the nearly twice as efficient square building introduces distances for structural spans (i.e., from 10ft to 31.6ft) in floor and roof framing that could offset some of the efficiency of the enclosure. As such, design ratios need to have appropriate latitude from a perfect ratio to reasonable ratio.

5. Life-span Standards

The premise of this standard is that quality matters in the selection of materials, systems, assemblies, and installation techniques when it comes to buildings. Life expectancy or life-span standards use measurements such as life-cycle cost analysis, to determine an appropriate target for obsolescence or replacement. A very low cost material with a long life-span is intuitively preferable over a very costly material with a short life-span if the primary consideration is cost. It is the same at the whole-building level. Of course there are other consideration that must be factored in to a complete analysis. Take, for instance, asbestos. For many years, when applied to needs in facilities and manufacturing, it was seen as a wonderful material. Low cost, long life span, great properties. Now, of course, we know of other considerations that must be taken into account with this material. Life-span standards will often drive up initial costs. However, if they are properly established, those initial costs should be offset by life-cycle savings.

6. Other Measures

There are a variety of tools to bring to bear when setting standards (i.e., life-cycle cost analysis, materials properties, etc.). This last section covers two tools which are often implemented as processes within the umbrella of cost-effective construction. The first is value analysis, and the second is commissioning. Both processes have a robust framework and ample definition for their application to building construction and could be required as standards for capital projects funded with state-aid. Value analysis, or value engineering, seeks to interject a formal, measured assessment of a planned solution against other possible solutions and determine which, if any, options might bring more value to the owner. It's an intentionally disruptive tool applied in measured way. Commissioning similarly seeks to interject a measured assessment of planned performance. Because all of the conditions to which a building is designed to respond may not occur prior to initial occupancy—or even for years following occupancy—the function of

various systems within the building may not be adequately tested. Commissioning is a formal means of intentionally testing those systems beforehand to ensure they operate properly when called upon. As with other standards, the costs of implementing these processes is intended to be repaid—often many fold—by the savings they identify.

Recommendation(s)

The strategy (ref. BR&GR 2017 Workplan) for Committee work under AS 14.11.104(b)(3) will need to address both the format and the content of any standards. Among the options presented, or among those that may be presented in the future, the department's desire would be for simplicity and clarity. Initially, these might both best be measured by the sheer volume of documentation which any one standard or another may imply or require. In addition, it seems like there might be a certain space (void) in the realm of standards that the state could most effectively fill, one that wouldn't overlap too heavily with standards at some national level (e.g., building codes) and those standards applicable at a school district level.

As a possibility, we would suggest development of a standard based on building systems that are indexed to the department's Cost Format, Level 3 and would include standards elements from items *1. Model Alaskan School, 4. Design Ratios*, and *5. Life-span Standards* in the Discussion section preceding.

A strategy to achieve this would likely need to include one or more sub-committees and outreach to stakeholders in related organizations dealing with education facility, planning, design, construction, and operation.

Department of Education & Early Development
Division of School Finance/Facilities

Work Topics for the BR & GR Committee

As Of: 3/30/17

BR&GR 2017 Work Items	Responsibility	Due Date
1. CIP Grant Priority Review – [(b)(1)]		
1.1. FY18 MM & SC Grant Fund Final Lists (4 AAC 31.022(a)(2)(B))	Committee	Feb 2017
1.2. FY19 MM & SC Grant Fund Initial List	Committee	Dec 2017
2. Grant & Debt Reimbursement Project Recommendations – [(b)(2)]		
2.1. Six-year Capital Plan (14.11.013(a)(1); 4 AAC 31.022(2))	Dept	Annually, Nov
3. Construction Standards for Cost-effective Construction – [(b)(3)]		
3.1. (None)		
4. Prototypical Design Analysis – [(b)(4)]		
4.1. *SB87 – Amendments to 14.11.014(b)(4)*	*Dept (w Cmte)*	*Sep 2017*
5. CIP Grant Application & Ranking – [(b)(5) & (6)]		
5.1. FY19 CIP Draft Application & Instructions	Dept	2-15-17
5.2. FY19 CIP Final Application & Instructions	Committee	2-28-17
5.3. FY19 CIP Briefing – Issues and Clarifications	Dept	Nov 2017
5.4. Facility Condition Survey Minimum Standard	Dept (w Cmte)	Dec 2017
6. CIP Approval Process Recommendations – [(b)(7)]		
6.1. Publication Updates		
6.1.1. Program Demand Cost Model for Alaskan Schools	Dept	Annually, Apr
6.1.2. Capital Project Administration Handbook – Final	Dept	Mar 2017
6.1.3. Alaska School Facilities Preventive Maintenance Handbook Initial	Dept	May 2017
Alaska School Facilities Preventive Maintenance Handbook Final	Committee	Dec 2017
6.1.4. Project Delivery Method Handbook Final	Dept	Sep 2017
6.2. New Publications		
6.2.1. *School Design & Construction Standards – Scoping Session*	*Dept*	*Apr 2017*
School Design & Construction Standards – Initial Draft	*Dept (w/Cmte)*	*Sept 2017*
School Design & Construction Standards – 2nd Draft	*Dept (w/Cmte)*	*Dec 2017*
School Design & Construction Standards – Final	*Committee*	*Jan 2018*
7. Energy Efficiency Standards – [(b)(8)]		
7.1. (None)		

Projected Meeting Dates

February 28, 2017 (Juneau), Full day
March 30, 2017 (Teleconference), Work Session
April (TBD) (Teleconference), Work Session, Standards
May (TBD) (Teleconference), Work Session, PM Handbook
September 6, 2017 (Teleconference), Half day
December 6, 2017 (Teleconference), Half day

Department of Education & Early Development
Division of Finance & Support Services/Facilities

Work Topics for the BR & GR Committee
AS 14.11.014
Updated: 3/30/17

BR&GR Work Items – Master List	Responsibility	Due Date
1. CIP Grant Priority Review – [(b)(1)]		
1.1. FYXX MM & SC Grant Fund Initial Lists (4 AAC 31.022(a)(2)(B))	Committee	Annually
1.2. FYXX MM & SC Grant Fund Reconsideration Lists	Committee	TBD
1.3. FYXX MM & SC Grant Fund Final Lists	Committee	TBD
2. Grant & Debt Reimbursement Project Recommendations – [(b)(2)]		
2.1. Six-year Capital Plan (14.11.013(a)(3); 4 AAC 31.022(2))	Dept	Annually
2.1.1. Statewide Inventory	Dept	TBD
2.1.2. Statewide Facility Appraisal	Dept	TBD
2.1.3. Statewide Condition Survey	Dept	TBD
2.1.4. Renewal & Replacement Database	Dept	TBD
2.1.5. Presentation by ASD on Facility Condition Indexing	Committee	TBD
2.2. School Capital Funding	Dept (w Cmte)	TBD
2.2.1. Review Process & Funding Streams for Rural & Urban Projects	Dept	TBD
2.3. State's Role in Design & Construction		
2.3.1. In Organized City/Boroughs	Dept	TBD
2.3.2. In REAAs	Dept	TBD
3. Construction Standards for Cost-effective Construction – [(b)(3)]		
3.1. Cost Model's Model School Analysis	Dept	2018
3.2. Cost Standards	Dept	TBD
3.2.1. Allowable Costs		
3.2.2. Cost/Benefit, Cost Effectiveness Guidelines		
3.2.3. Life Cycle Cost Guidelines		
3.3. Commissioning	Committee	TBD
3.4. Materials/Systems Analysis	Committee	TBD
3.5. Design Issues	Committee	TBD
3.5.1. Design Ratios		
3.5.2. Value Analysis		
3.6. Construction	Committee	TBD
3.6.1. Construction Duration		
3.6.2. Quality		
3.6.3. Component Use and Specifications		
4. Prototypical Design Analysis – [(b)(4)]		
4.1. SB87 – Amendments to 14.11.014(b)(4)	Committee	2017
5. CIP Grant Application & Ranking – [(b)(5) & (6)]		
5.1. FYXX CIP Draft Application & Instructions (14.11.013)	Dept	Annually
5.2. FYXX CIP Final Application & Instructions	Committee	Annually
5.3. Separate School Construction and Major Maintenance Applications	Committee	
5.4. Separate Grant and Debt Applications	Committee	2019
5.5. Appendix D Update – Type of Space Added or Improved	Committee	2018
5.5.1. New Classifications & Terminology		
5.6. Duration of a Qualifying Condition Survey	Committee	(completed)
5.7. Facility Condition Survey Minimum Standard	Dept (w Cmte)	2017
5.8. Review Issues with "Primary Purpose" Designations		

5.8.1. Playgrounds, Parking Lots, etc.		
5.9. Rural Definition For Art (see Instructions, Appx C)	Committee	TBD
5.10. Space Allocation Issues (4 AAC 31.020(c))	Committee	TBD
5.10.1. Career Tech		
5.10.2. Resource Rooms and Special Ed		
5.10.3. Space Related to Security		
5.10.4. Net vs. Gross		
5.10.5. Electrical/Mechanical Space		
5.10.6. Storage in Remote Areas		
5.10.7. “Found Space” (cost-effectiveness test)		
5.10.8. Replacement Schools Clarifications		
5.10.9. Non-school Facilities		
5.10.10. Educational Adequacy/Space Increase		
5.10.11. Community Use Space		
5.10.12. Pre-school		
5.10.13. Out-of-District Enrollment (vocational/charters, etc.)		
5.10.14. Second Attendance Area Schools		
5.10.15. Enrollment Projection Models		
5.10.16. Standard Gym Size		

6. CIP Approval Process Recommendations – [(b)(7)]

6.1. Publication Updates (4 AAC 31.020(a))		
6.1.1. Program Demand Cost Model for Alaskan Schools	Dept	Annually
6.1.2. Capital Project Administration Handbook	Dept	2017
6.1.3. Alaska School Facilities Preventive Maintenance. Handbook	Dept (w Cmte)	2017
6.1.4. Project Delivery Method Handbook	Dept	2017
6.1.5. Cost Format – *EED Standard Construction Cost Estimate*	Dept	2018
6.1.6. Space Guidelines Handbook	Dept (w Cmte)	2018
6.1.7. Life Cycle Cost Analysis Handbook	Dept (w Cmte)	2019
6.1.8. Swimming Pool Guidelines	Dept (w Cmte)	2019
6.1.9. Guide for School Facility Condition Surveys	Dept (w Cmte)	2019
6.1.10. A Handbook to Writing Educational Specifications	Dept (w Cmte)	2020
6.1.11. Site Selection Criteria and Evaluation Handbook	Dept	2020
6.1.12. Facility Appraisal Guide	Dept	TBD
6.1.13. Guidelines for School Equipment Purchases	Dept (w Cmte)	TBD
6.2. New Publications		
6.2.1. School Design & Construction Standards	*Dept (w Cmte)*	*2018*
6.2.2. Architectural and Engineering Services for School Facilities	Dept	2019
6.2.3. Outdoor Facility Guidelines for Secondary Schools	Dept	TBD
6.2.4. Renewal & Replacement Guideline	Dept	TBD
6.3. Regulations		
6.3.1. Commissioning Requirements	Dept (w Cmte)	TBD
6.3.2. CIP “Primary Purpose”	Dept (w Cmte)	TBD
6.4. Online Application	Dept	TBD
6.5. Database Review		
6.5.1. Consolidate Into Single Database	Dept	TBD
6.5.2. Coordination With Unity Project	Dept	TBD
6.5.3. ADM By Grade Level	Dept (SERRC)	TBD

7. Energy Efficiency Standards – [(b)(8)]

7.1. Reporting Requirements	Dept (w Cmte)	TBD
7.2. Energy Modeling	Dept (w Cmte)	TBD

Criteria for Alaskan School Construction

Mission Statement

The Construction Standard Subcommittee shall develop school construction criteria that shall establish minimum design, material, and construction standards intended to achieve cost effective construction and operation of Alaskan schools.

Due to the climatic and economic variations throughout the state the standards shall be performance based and flexible.

Material and construction standards shall be outlined in a building system basis. Acceptable performance levels for each building system shall be identified based on life expectancy, initial cost, and life cycle cost.

Design standards shall be outlined in a building system basis. Acceptable performance levels evaluated based on design efficiency ratios and building performance properties.

The EED Cost Format shall be used to organize the building system structure of the design, material, and construction standards.

Section (# & Section Name)

Part 1 – General Characteristics

1.1 Definition of the Building System (use Level 4 information from EED Cost Format worksheet and add information as deemed necessary)

Part 2 – Performance Characteristics (define units to be evaluated, acceptable quantities, applicable standards, and a general description for each applicable category)

2.1 Acoustic Performance:
2.2 Corrosion Resistance:
2.3 Earthquake Resistance:
2.4 Energy Efficiency:
2.5 Environmental Performance:
2.6 Fire Resistance:
2.7 Life Expectancy:
2.8 Life Cycle Performance:
2.9 Maintenance Requirements:
2.10 Thermal Expansion:
2.11 Thermal Performance:
2.12 Vandal Resistance:
2.13 Water Resistance:
2.14 Wind Resistance:

Part 3 – Design Characteristics

3.1 Design Ratios: some sort of numeric evaluation that establishes parameters of an acceptable design (i.e. exterior wall area not to exceed 75% of floor area, ventilation system not to exceed 2 CFM/GSF, etc.)

3.2 Design Requirements: some sort of rules that establish parameters of an acceptable design (i.e. average temperatures below which headbolt heaters should be provided, acceptable site development costs for a school, etc.)

3.3 Commissioning Requirements: commissioning or training requirements of the building assembly

3.4 Special Considerations: other specific design advice specific to the building system

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Contributors

Tim Mearig, AIA
Architect
Alaska Department of Education & Early Development
Juneau, Alaska

Nathan Coffee
Architect Assistant
Alaska Department of Education & Early Development
Juneau, Alaska

Don Carney
Facility Management Specialist
Alaska Department of Education & Early Development
Juneau, Alaska

Kim Andrews
Project Assistant
Alaska Department of Education & Early Development
Juneau, Alaska

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Introduction

"develop criteria for construction of schools in the state; criteria developed under this paragraph must include requirements intended to achieve cost effective school construction"[1]

In 1993, the Alaskan legislature created the Bond Reimbursement and Grant Review Committee with AS.14.11.014 and identified the committee's purpose. Among their many tasks, the committee was charged with the development of criteria intended to achieve cost effective school construction in the State of Alaska. Those familiar with construction in the State of Alaska know that this is no easy task given the wide range of climates found in Alaska, the differences in school sizes between urban and rural Alaska, and the logistical difficulties of building in remote areas with limited construction seasons. A construction or design standard ideally suited to one region of the state can be a disaster elsewhere. Thus, the task has remained untouched until recently when the committee acknowledged the need for some sort of guidelines that will assist in the design and construction of school facilities.

Rather than focus solely on initial construction cost, the committee feels that it is imperative to consider the long term operations and maintenance of a school facility when defining cost effective school construction. A quality school facility that does not create an undue burden on the school district's annual operating budget is obviously preferable to a money-pit school facility that is a drain on a district's financial resource no matter how "cost effective" its initial construction may have been. Therefore, this publication will not only consider the initial cost of construction with its recommendations, but the definition of "cost effective" will be broadened to include the operations and maintenance expenses, essentially looking at design and construction decisions on a life cycle basis.

The guidelines incorporated in this handbook have been developed to assist Alaskan school districts, their consultants, and communities in developing quality school facilities that will be affordable to construct and operate. The guidelines are intended to be flexible enough to be applicable to the variety of climatic and programmatic factors that influence school design.

[1] Alaska Statute 14.11.014 (b)(3)

Site Work

Site development is the most widely varying cost element between school construction projects. Many determinants influence the ultimate cost of site development for a project. Some determinants are programmatic, for instance, site development costs for a high school will be higher than those of an elementary school due to specialized sporting facilities typically provided with the construction of a high school. The location of the site and proximity to utilities also can greatly affect the site development costs. Rural sites can have much greater utility costs than urban sites due to the need to provide utility infrastructure, such as water storage and treatment, sewage treatment and disposal, and heating oil storage, that urban sites are not required to provide. The physical characteristics of the site, such as soil conditions and topography, also have a great impact on the site development costs. Sites that require a good deal of excavation, grading, or imported fill to provide an adequate building pad will understandably have higher earthwork costs when compared to building sites not requiring such extensive alterations. The cost of earthwork is not limited to the building footprint; the construction cost of playfields, parking areas, roads, and even utility infrastructure will be impacted by the physical characteristics of the site.

The selection of a quality building site is the first step in containing site development costs. The department's publication "Site Selection and Evaluation Criteria Handbook" is intended to be a resource and tool for districts to use when evaluating potential school sites. Thus, the quality of soils should be given significant weighting when evaluating site options

Design Criteria

- Site earthwork should attempt to achieve no import or export of soil – this will clearly be difficult on sites with poor soils
- Site utilities should be provided offsite by the public utility whenever possible – this includes water, sewer, electrical, and fuel storage utilities at rural sites and efforts should be made to work with the community to a developed shared utility infrastructure
- Development of vehicular circulation and storage areas shall be minimized
- Parking areas will be sized to provide the required parking spaces per the governing code and the parking spaces will be sized to accommodate the standard vehicle in the region
- Construction of fire service roads around school buildings is not required in communities that do not have an organized fire fighting capacity and equipment
- Roads and parking areas shall be consolidated to minimize their footprint on the site

Foundations

Foundation systems are typically far more expensive in Alaska than in other parts of the country. Usually foundation system options are limited by the soil conditions of a particular site. As it affects the cost of site development, the soil conditions of the selected site also play a large part in the cost of the foundation system and determining the number of foundation system options that are acceptable on a given site. Thus, the quality of soils should be given significant weighting when evaluating site options.

Due to the relative high cost of foundation systems, consideration should be given to the construction of two-story structures for school facilities exceeding 40,000 GSF. The cost savings of a two story structure is not only limited to the foundation system. When evaluating the potential cost savings of a two-story design versus a single story, other building systems, such as roofing, vertical circulation, and exterior wall, should be considered. The shipping weight of the potential foundation system as well as the installation cost should be taken into consideration when evaluating foundation system options. Building sites whose soil conditions allow the use of standard concrete foundations are preferable to sites that require piling foundations.

Design Criteria

- Multi-story construction shall be considered and presented as a schematic design option for all school structures over 40,000 GSF
- Where appropriate for soil conditions, standard concrete foundations are almost always the preferred foundation system
- Where soils are of low moisture content, all weather wood foundations should be considered for facilities smaller than 20,000 GSF
- Where appropriate for soil conditions, foundation systems utilizing a heated crawlspace with perimeter closure are preferable to foundation systems that utilize an elevated building with an air space between the underside of the building and grade

Structural Systems

For the purpose of this discussion, the structural system is the facility's supporting structure from the foundation to the roof deck. The structural system can be divided into two assemblies: floor systems and roof systems. Four elements comprise most elevated floor assemblies: floor sheathing, joists, posts, and beams. This assembly is a combination of uniform loading and point loading structural systems. The exception is an assembly that substitute wood pony walls and continuous footings for posts and beams. In such instances, an entirely uniform loading floor system can be achieved. Due to the use of lighter framing materials and the lack of concentrated point loads, the entirely uniform loaded floor system is typically the most cost-effective elevated floor system. It should be noted that concrete slab on grade floor systems are the least expensive floor system in areas where concrete is readily available.

The same can be said for roof assemblies that are typically comprised of roof sheathing, roof rafters or trusses, beams, and columns carrying concentrated vertical loads to the foundation or a lower floor assembly. Structural roof assemblies that utilize load-bearing partitions are typically more cost-effective than assemblies that use post and beam systems to bear vertical loads. With the inclusion of the structural insulated panel in the roof assembly and its use to replace both the roof sheathing and roof rafters or trusses due to its large span and loading limits, roof assemblies have become more reliant on a post and beam assembly. While the use of structural insulated roof panels may have reduced the time required to fully construct the structural roof assembly, its inherent inclusion of heavily loaded beams and columns adds to the overall cost of the structural assembly.

The previous paragraphs deal with how the structural systems are designed to accommodate gravity loads. Consideration must also be given to how the structural system performs under lateral, seismic, and wind loading conditions. The best way to design a cost-effective structural system to handle wind loads is to limit them. The building's form and massing play a significant role in limiting the structure's exposure to wind loads and should be considered by the architect at the outset of design. Buildings that expose large areas of high bay space to lateral wind loads will be conducive to cost-effective structural design.

Design Criteria

- All single story structures and smaller (60,000 GSF or less) two story structures should utilize uniform loading structural systems (i.e. load bearing walls) wherever feasible.
- Building massing should limit exterior wall area and exterior exposure of large high bay spaces to wind loads.

Exterior Closure

Exterior closure systems bear the brunt of Alaska's harsh climate. They must be able to endure large variations in seasonal temperatures. While fraught with differing elements and junctions of such elements, the assembly must remain weather tight, even in Alaska's extreme wind and rain. To achieve optimal performance, the exterior assembly should be constructed of quality materials and craftsmanship. The construction of a high performance exterior assembly is expensive, so the design of a school facility should strive to reduce the amount of exterior wall area that is to be constructed. This is not only cost-effective in terms of initial cost, but is also cost-effective in terms of operations, maintenance, and replacement costs. By reducing the area of the exterior closure system, the area for heat loss is reduced, the area to be painted or regularly maintained is reduced, and when the exterior finish has reached the end of its useful life, the area to be replaced is reduced. All of these factors contribute to reduce the life cycle cost of the school facility.

Oftentimes, a facility's exterior closure system will also serve as part of the facility's structural system by transferring roof and floor loads to the foundation system. The use of an assembly that serves dual purposes is a giant step toward the cost effective design of a facility. Wall assemblies constructed from dimensional lumber, structural insulated panels, metal studs, and concrete masonry units are all capable of serving this dual purpose role as exterior closure and structural system. Each material assembly has its own strengths and weaknesses that require the designer to determine the systems appropriateness for a given project. However, as noted earlier, load bearing exterior wall systems deserve serious consideration on most projects.

Design Criteria

- All single story structures and smaller (60,000 GSF or less) two story structures should utilize a load bearing exterior wall assembly wherever feasible
- School facilities less than 20,000 GSF shall have a maximum exterior closure area (excluding roof soffits) to GSF ratio of .8 and a maximum number of one exterior door leaf per 2000 GSF
- School facilities between 20,000 and 40,000 GSF shall have a maximum exterior closure area (excluding roof soffits) to GSF ratio of .7 and a maximum number of one exterior door leaf per 2500 GSF
- School facilities greater than 40,000 GSF shall have a maximum exterior closure area (excluding roof soffits) to GSF ratio of .6 and a maximum number of one exterior door leaf per 3000 GSF
- Exterior glazing area shall not exceed 10% of the exterior closure area
- Building massing should limit exterior exposure of large high bay spaces to wind loads

Roofing

One of the most problematic building systems on Alaskan school facilities is the roofing. Every year a large portion of the major maintenance grant requests submitted to the department involve some sort of roof repairs and replacement. Leaky roofs are a distraction to students and educators. In addition, they degrade building structural systems and finishes, oftentimes creating damages whose repair costs dwarf the repair cost of the leak itself. Many school districts' maintenance staffs spend an inordinate amount of time chasing roof leaks and repairing the damage they have created. But roof issues aren't just limited to leaks. The insulation property of a facility's roofing system is also an important design consideration. As the primary point of heat loss, the design and construction of the roof system must be suited to the Alaskan climate.

The easiest way to reduce the potential roofing problems and initial construction cost of a high performance roofing system is to reduce the area of roof to be constructed. By decreasing the roof area of a facility, the annual roof maintenance effort is reduced, thus reducing the system's maintenance cost. Reducing the primary area of building heat loss also reduces the annual heating cost for a facility. Lastly, a reduction in roof area also reduces the future replacement cost of the roofing system.

It has already been established that multi-story construction can reduce the initial cost of foundation systems. Multi-story construction also leads to initial roof construction cost savings, as well as operations, maintenance, and replacement cost savings.

Design Criteria

- Multi-story construction shall be considered and presented as a schematic design option for all school structures over 40,000 GSF
- Hot roof design is preferable to a vented cold roof especially in facilities possessing a wood structural system
- Roof penetrations will be minimized by consolidation of plumbing vents and other systems where possible
- Roof penetrations will be located near the ridge or top of the roof slope to reduce potential snow damage and roof leaks
- Roof design shall be simple and not broken into planes or cut-up by unnecessary dormers
- Water shedding roof systems shall be constructed at a minimum of a 3:12 slope
- Metal roof with exposed fasteners are not to be utilized on new construction or replacement roof projects

Interiors

Interior partitions, doors, finishes, and fixed furnishings typically account for ~10-12 % of a project's total construction cost. In a traditional school design, the cost of partitions and doors are fairly consistent. However, the use and quantity of special partitions such as glazing and movable partitions varies between school designs and can significantly impact the cost of the interiors. The use and quantity of casework also varies between school designs, thus affecting the project cost. The material choice and specification of interior floor, wall, and ceiling also plays a large part in determining the cost of a project's interiors.

Design Criteria

- Interior glazing and operable partitions should be used prudently
- Interior doors should be limited to one per every 400 GSF
- Alternative storage solutions, such as closets with shelving in lieu of casework, should be considered
- Entries and circulation corridors should utilize a durable, non-staining, non-slip floor material
- In areas without paved walk and road surfaces, gym floors should utilize a sheet athletic flooring or a poured urethane floor in lieu of a wood floor to minimize damage to floor from tracked in soils
- Interior spaces and floor finishes should be laid out in a manner that reduces seams and material waste

Mechanical Systems

Mechanical Systems join Interiors as one of the higher cost building systems and similarly account for ~10-12% of a project's total construction cost. Mechanical systems include plumbing, HVAC, sprinklers, and other piped or ducted distribution and exhaust systems. Also, like Interiors, Mechanical Systems are subject to initial cost savings by specification of materials or equipment, but oftentimes the reduction in initial cost is offset by increased maintenance and operation costs over the life of the system. It is important that the cost effectiveness of all material and equipment specifications is evaluated on a life cycle basis.

Plumbing systems have the most potential for cost savings because they are not required throughout the facility by code, whereas HVAC and sprinkler systems are. Consolidation of plumbing systems to core areas to limit piping runs and reduction of the overall plumbing fixture count are design decisions that limit a project's plumbing cost. Fine-tuning the design of the HVAC systems can also generate cost savings. Oddly, even in Alaska, cooling requirements typically govern duct sizing. By designing the cooling system to an actual rather than fire code room occupancy, establishing a higher acceptable maximum temperature, and incorporating operable windows into the design calculations, duct sizes can be reduced, thus reducing air handler capacity and potentially mechanical space required. Wet sprinkler systems are less expensive than dry systems, so reducing or eliminating the need for dry sprinkler systems will reduce the cost of the facility.

Design Criteria

- Boilers should be designed to burn #2 diesel fuel or natural gas where available
- Hot water should be generated from the heating system boilers, rather than by a separate heat generating burner
- Sinks or other plumbing shall not be provided in standard classrooms that serve grades 4 and greater
- Ventilation systems shall be sized per the estimated room occupancy rather than the fire egress code occupancy
- Maximum interior design temperature for ventilation system design shall be 75 degrees Fahrenheit or greater
- Where operable windows are furnished, design of the ventilation system shall incorporate the cooling and ventilation capacity of the windows

Electrical Systems

Of all the building systems, a school facility's Electrical Systems have probably experienced the greatest increase in scope and cost over the last 10 years. With the integration of computers in education, first into the school and now into the classroom, the scope of network data systems has increased dramatically. A bi-product of the increased number of computers is a corresponding increase in the power systems required to operate the computers. An increase in the scope and complexity of other special electrical systems, in particular fire alarm and detection systems, has also increased the overall cost of electrical systems.

Due to the fact that many of the electrical systems are required by code (power, lighting, and fire alarms), a baseline cost for Electrical Systems is part of all school facility projects. However, cost savings opportunities still exist in the scope of these systems beyond the minimums established by codes and in the materials specified. It is important for the cost effectiveness of electrical systems to be evaluated on a life cycle basis where the operating and maintenance cost of the system is considered. Often, a more expensive lighting fixture will more than pay for itself over time by a reduction in power consumption.

Other optional electrical systems (security systems, phone/data systems, intercom systems) should be evaluated in the same manner as code required systems. In addition to a life cycle analysis of the systems and their components, the optional systems should also pass a common sense test. For instance, is it necessary for a four-classroom school to have an intercom system? Does it make sense for a school designed to house 50 students to have 75 data outlets?

Design Criteria

- Fluorescent light fixtures should be utilized whenever possible in lieu of incandescent or other lamp types
- Lighting control options should be evaluated on a life cycle basis
- Computer data ports and related outlets shall be laid out as they are to be used, not as they might be used in the future
- Power wiring and service shall be size per the present electrical demand of the facility rather than to meet perceived future demands

Conclusion

As the cost of construction and school facility operations continue to increase, it is necessary for the state to allocate its resources in the most efficient and cost-effective manner. While many school improvement projects have been undertaken and completed in recent years, many more needed capital school improvement projects exist in Alaska. It is essential that future school facility improvement projects are designed and constructed in an efficient, cost-effective manner that not only considers the initial investment in the facility, but also focuses on the long-term operations, maintenance, and replacement cost of the facility and its building systems.

The intent of this handbook is to establish some general rules to achieve efficient and cost-effective school construction. This handbook is to serve as a guideline to districts and designers as they evaluate the many options that arise during the development of a school construction project. The department will also use the guidelines outlined in this handbook to evaluate the cost effectiveness of a particular school design, thus establishing a project's funding eligibility per AS 14.11.100 (h).

Bibliography

Sieglinde K. Fuller and Stephen R. Petersen, *NIST Handbook 135: Life Cycle Costing Manual for the Federal Energy Management Program*, Washington: U.S. Government Printing Office, 1996.

Alphonse Dell'Isola, *Value Engineering: Practical Applications for Design, Construction, Maintenance & Operations*, Kingston MA: R.S. Means Company, Inc., 1997.

Stephen J. Kirk and Alphonse J. Dell'Isola, *Life Cycle Costing for Design Professionals*, McGraw-Hill, Inc., 1995.

Wolter J. Fabrycky and Benjamin S. Blanchard, *Life-Cycle Cost and Economic Analysis*, Englewood Cliffs, NJ: Prentice Hall, 1991.

American Society for Testing and Materials, *Standard Practice for Measuring Life-Cycle Costs of Buildings and Building Systems*, Philadelphia: ASTM, 1994.

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SECTION 01810
COMMISSIONING

PART 1 – GENERAL

1.01 DESCRIPTION

A. General: Commissioning is a systematic process of ensuring that all building systems perform interactively according to the design intent and the Owner/User operational needs. The commissioning process shall include and coordinate the traditionally separate functions of system documentation, equipment startup, control system calibration, testing and balancing, performance testing and training.

B. Intent: Commissioning is intended to demonstrate that mechanical, electrical, and controls systems, equipment items, components thereof, devices, and etc.; described in specification Division 15 and 16 of these contract documents; have been adequately checked out by installation contractors and that each perform safely in accordance with:

1. The design intent of the engineer of record,

2. Manufacturer's published recommendations, and

3. Published industry minimum standards.

C. Preconstruction responsibilities:

1. Schedule Commissioning Scoping Meeting

2. Prepare Draft Commissioning Plan

3. Develop Draft Commissioning Schedule

D. Management: The Commissioning Contractor shall be a subcontractor to the project's General Contractor.

E. Responsibilities: The commissioning process does not remove or reduce the responsibility of the installation contractors to provide a finished and fully functioning product.

1.02 COORDINATION

A. Commissioning Team: The member of the commissioning team consist of:

1. Commissioning Contractor

2. Owner's Representative

3. General Contractor

4. Mechanical Subcontractor

5. Electrical Subcontractor

6. Test and Balance Subcontractor

7. Controls Subcontractor

8. Users Maintenance and Operations Manager

9. Division 11 Subcontractors

10. Division 14 Subcontractors

B. Commissioning Scoping Meeting. Within 120 days of the Notice to Proceed with construction, a Commissioning Scoping Meeting shall be convened by the Commissioning Contractor, refer to paragraph 3.01, A.1. All members of the Commissioning Team shall attend this meeting. The purpose of the meeting is to review the role of each Commissioning Team member within the commissioning process, to introduce the Draft Commissioning Plan, and to develop the framework for a commissioning schedule.

C. The General Contractor shall be responsible for all expenses associated with the meeting including travel, housing, (if necessary), but not limited to, for all attendees.

D. The General Contractor shall determine the most suitable location for the meeting and notify the team members in advance.

E. The Commissioning Plan: Commissioning Contractor shall prepare a comprehensive Commissioning Plan. Contents of this plan shall include, but not be limited to:

1. General Commissioning Management Plan (commissioning process, phased commissioning, plan execution, startup plans, and etc.).

2. Commissioning Schedule

3. Resume and qualification package of the Commissioning Contractor

4. Deficiencies and non-conformance resolution procedures

5. Commissioning Team Data (contact directory)

6. Communications Protocol (submittals, requests for information, progress reporting and logs, commissioning progress report, commissioning memorandum, standard submittals, special submittals, notifications and clarifications pre-functional checklists, tests and startup procedures and etc.)

7. Document management

8. Controls checkout plan

9. Roles and Responsibilities Commissioning Scoping Meeting Agenda

10. Scope of testing

    a. Sampling

    b. Test and balance verification

    c. Development of functional test and verification procedures

    d. Facility staff participation

    e. O & M Manuals and Warranties reviews

    f. Final Commissioning Report and Certification

F. Scheduling: During that meeting Commissioning Contractor shall provide the initial schedule of primary commissioning activities. As construction progresses the Commissioning Contractor shall up-date the commissioning schedule and add detail for commissioning activities to be undertaken during the up-coming 90 days. The Commissioning Contractor shall work with the Owner's Representative and General Contractor to established protocols to schedule commissioning activities. The Commissioning Contractor shall provide sufficient notice to the Owner's Representative and General Contractor for scheduling commissioning activities. The General Contractor will integrate all commissioning activities into the project's master schedule. All parties will address scheduling problems and make necessary notifications in a timely manner in order to expedite the commissioning process.

1.03 COMMISSIONING PROCESS

A. Commissioning Process: The following narrative provides a brief overview of the commissioning tasks during construction and the general order in which they occur.

1. Commissioning Scoping Meeting: Commissioning during construction begins with a scoping meeting conducted by the Commissioning Contractor where the commissioning process is reviewed with the commissioning team members.

2. Additional commissioning coordination meetings will be required throughout construction. These additional meetings shall be scheduled by the Commissioning Contractor. The purpose of the meetings is to plan, coordinate and schedule activities, and resolve problems.

3. Mechanical, Electrical, and Controls subcontractors shall submit equipment documentation to the Commissioning Contractor during the normal submittals process. Such submitted information shall include detailed startup procedures.

4. The Commissioning Contractor shall work with Mechanical, Electrical, and Controls subcontractors to developing startup plans, format for startup documentation, and pre-functional checklists to be completed by the Mechanical, Electrical, and Controls contractors during the check-out and startup process.

5. Process Sequences: The checkout and performance verification process proceeds from simple o complex; from component level, to equipment, to systems, and intersystem levels with pre-functional checklists being completed before functional testing.

6. The Mechanical, Electrical, and Controls subcontractors, under their own direction, execution and document the pre-functional checklists and perform startup and initial checkout. The Commissioning Contractor may choose to witness startup of selected equipment.

7. The Commissioning Contractor may develop functional performance and test procedures for specific equipment and system. The Mechanical, Electrical, and Controls subcontractors shall review such test procedures, as applicable, executed said procedures under the direction of the Commissioning Contractor. The Commissioning Contractor shall document all such tests.

8. In the event that systems, equipment, devices, controls, and etc. do not perform as specified by the project documents, or the intent of the engineer of record, the deficiency shall be corrected and the appropriate test procedure repeated.

1.04 RELATED WORK

A. Specific commissioning requirements are given in the following sections of these specifications. All of the following sections apply to the Work of this section.

1. Division 11 – Equipment

2. Division 14 – Conveying Equipment

3. Division 15 – Mechanical

4. Division 16 – Electrical

1.05 RESPONSIBILITIES

A. The responsibilities of various parties in the commissioning process are provided in this section. The responsibilities of the Mechanical contractor, Test and Balance contractor, and Controls contractor are described in Division 15. Responsibilities of the Electrical contractor are described in Division 16.

B. All Parties: Attend commissioning scoping meeting and additional meetings, as necessary.

C. General Contractor: The General Contractor shall be responsible for:

1. Access, tools, lifts, ladders, scaffolds, transportation, and other support required for the efficient execution of the Commissioning Plan.

2. Furnish a copy of all construction documents, addenda, change orders and approved submittals and shop drawings elated to commissioned equipment to the Commissioning Contractor.

3. Attend Commissioning Scoping meeting and other necessary coordination meetings.

4. Scheduling and coordination of the activities of the Mechanical, Electrical, Controls, and Commissioning contractors.

5. Provide current as built drawings to support commissioning.

D. Mechanical and Electrical Engineers of Record:

1. Perform normal submittal review, as contracted.

2. Provide design narrative and sequences documentation requested by the Commissioning Contractor.

3. Provide design clarification information upon request.

4. Participate in the resolution of system deficiencies identified during commissioning.

5. Review pre-functional checklists for major pieces of equipment.

6. Review functional test procedure forms for major pieces of equipment.

E. Commissioning Contractor: The principal role of the Commissioning Contractor is to develop and coordinate the execution of a testing plan, observe and document performance of mechanical and electrical systems so as to certify that said systems are functioning in accordance with the documented design intent and in accordance with the Contract Documents.

1. Coordinate the commissioning work the General Contractor and Owner's Representative.

2. Coordinate of commissioning activities using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties.

3. Plan and conduct a commissioning scoping meeting and other commissioning meetings as may be required to efficiently coordinate the activities of the Commissioning Plan.

4. Notify Governments Owner's Representative and General Contractor deficiencies in results or procedures.

5. Participate in problem solving for non-conformance or deficiencies.

6. Review construction meeting minutes for revisions/substitutions relating to the commissioning process. Assist in resolving any discrepancies.

7. Before startup, gather and review control sequences and interlocks and work with Mechanical, Electrical, and Controls subcontractors, o develop detailed testing procedures.

8. Review Mechanical, Electrical, and Controls subcontractor's submittals for compliance with commissioning needs.

9. Review Test and Balance Contractor execution plan.

10. Review equipment warranties to ensure that the Government's responsibilities are clearly defined.

11. Provide portable data-loggers.

12. Providing timely schedule update.

13. Prepare and distribute pre-functional tests and checklists. Prepare a startup and initial systems checkout plan in cooperation with Mechanical, Electrical, and Controls subcontractors.

14. Perform site visits, as necessary, to observe component and system installations.

15. Attends selected planning and job-site meetings to obtain information on construction progress.

16. Witness and document ductwork testing and cleaning procedures as specified in the Commissioning Plan.

17. Witness and document HVAC piping test and flushing procedure as specified in the Commissioning Plan.

18. Witness functional testing of the control system prior to HVAC system test and balance activities.

19. Witness performance testing of smoke control systems.

20. Witness testing of by manufacturer's personnel as specified in the Commissioning Plan.

21. Certify pre-functional tests and checklist completion via methods specified in the Commissioning Plan.

22. Certify systems startup as specified in the Commissioning Plan.

23. Certify air and water systems balancing by methods specified in the Commissioning Plan.

24. Prepare the functional performance test procedures for equipment and systems.

25. Analyze functional performance trend logs and monitoring data to verify performance according to methods specified in the Commissioning Plan.

26. Coordinate, witness, and certify manual functional performance tests performed by installation contractors.

27. Coordinate retesting as necessary until satisfactory performance is achieved.

28. Maintain a master deficiency and resolution log and a separate testing record.

29. Provide the Owner's Representative with written progress reports and test results with recommended actions.

30. Compile and maintain a commissioning record.

31. Provide a final commissioning report.

F. Owner's Representative's Responsibilities

1. Furnish copies of all construction documents, addenda, change orders, approved submittals, and shop drawings related to commissioned equipment.

2. Review and approve the final Commissioning Plan.

3. Attend a Commissioning Scoping meeting and other commissioning team meetings.

4. Perform the submittal review and approvals.

5. Review and approve the functional performance test procedures.

6. Review commissioning progress and deficiency reports.

7. Coordinate the resolution of non-compliance and design deficiencies during execution of the Commissioning Plan.

8. Approve individual commissioning tests as completed and passing.

9. Approve completion of the commissioning process.

10. Arrange for facility operating and maintenance personnel to attend various field commissioning activities and field training sessions in accordance with Commissioning Plan.

1.06 SUBMITTALS

A. Commissioning Plan: Within 90 days of project. Notice to Proceed, the Commissioning Contractor shall submit a Draft Commissioning Plan. The Final Commissioning Plan shall be submitted within 30 days of completion of review of the Draft Commissioning Plan.

B. Progress Report: Submit commissioning progress reports monthly. Progress reports shall include, but shall not b e limited to schedule up-date information, deficiencies, test progress, field reports regarding test witnessing, and minutes of coordination meetings.

C. Pre-functional tests and checklists: Within 120 days of Notice to Proceed, Commissioning Contract shall submit pre-functional tests and checklists.

D. Startup and Initial Systems Checkout Plan: Within 120 days of Notice to Proceed, Commissioning Contract shall submit a Startup and Initial Systems checkout plan. This plan shall be prepared in cooperation with Mechanical, Electrical, and Controls subcontractors.

E. Functional Performance Test Procedures: Within 120 days of Notice to Proceed, Commissioning Contract shall submit a Draft Functional Performance Test Procedure for Equipment and Systems.

F. Draft Final Commissioning Report: Within 30 days of completion of he Commissioning Process (as prescribed in the Commissioning Plan) the Commissioning Contract shall submit a Draft Final Commissioning Report. Final Commissioning Report: The Final Commissioning Report shall be submitted within 30 days of completion of review of the Draft Commissioning Report.

G. Resume and qualification package of Commissioning Contractor members.

1.07 DEFINITION

A. Acceptance Phase: The acceptance phase of the project occurs after the Mechanical, Electrical, and Controls contractors have performed pre-functional testing (initial equipment startup and system checkout). The Commissioning Contractor performs (or witnesses) functional performance tests during the Acceptance Phase of the project.

B. Basis of Design: The basis of design is the documentation of the primary thought process and assumptions behind design decisions that were made to meet the design intent. The basis of design describes the systems, components, conditions and methods chosen to meet the intent. Some reiterating of the design intent may be included.

C. Certification: Upon witnessing the functional testing of mechanical, electrical, and control devices, components, equipment, and systems, the Commissioning Contractor certifies that a piece of equipment or system has been properly installed and is functioning according to the requirements of the Contract Documents and the intent of design.

D. Commissioning Contractor: An independent Contractor, retained by the General Contractor who plans, schedules, coordinates, and directs the day-to-day commissioning activities. The Commissioning Contractor certifies that each mechanical, electrical, and controls system has been properly installed, tested and performs as intended by the design engineer.

E. Commissioning Manual: The Commissioning Manual is a document that contains the Design Narrative, and outlines the requirements of the commissioning process.

F. Commissioning Plan: The Commissioning Plan is the plan that provides the structure, schedule and coordination planning for the commissioning process.

G. Contract Documents: The set of documents binding on parties involved in the construction of this project (drawings, specifications, change orders, amendments, contracts, and etc.).

H. Controls subcontractor: One of several installation contractors.

I. Control System: The central building energy management control system

J. Owners Representative: Represents the Owner/User's interests and is the contracting authority that provides approvals on behalf of the Owner/User and is the authority concerning interpretation of the Contract Documents.

K. Datalogging: The datalogger is a standalone devise, separate from the control system, used to monitoring flows, currents, status, pressure, etc.

L. Deferred Functional Tests: Functional tests that are performed after substantial completion as a result of partial occupancy, seasonal requirements, site conditions that prohibit scheduled testing.

M. Deficiency: A deficiency is a condition in the installation or function of a component, piece of equipment, or system that is not in compliance with the design intent or provisions of the Contract Documents.

N. Design Intent: Design Intent is the intended performance requirement systems, equipment, component, or devise as intended by the design engineer (expressed in the Design Narrative), or as prescribed in the Contract Documents.

O. Design Narrative and Design Documentation: The design narrative and design documentation are contained within project Design Analysis, the Commissioning Manual, and the Contract Documents (contract plans and specifications).

P. Electrical Engineer: The Electrical Engineer is the consultant to the Project Architect who supervised preparation of the E series contract drawings and specification Division 16 of the Contract Documents.

Q. Electrical Subcontractor: One of several installation contractors who is in the employ of the project General Contractor.

R. Factory Testing: Factory testing is defined herein as on-site equipment testing conducted by a representative of the equipment manufacturer; in the presence of the Commissioning Contractor.

S. Full Operation: Operating under the full range of control and load conditions.

T. Functional Performance Test (Functional test): Functional testing is the dynamic testing of systems under full operation.

U. Functional Performance Tests require systems testing ;;under various modes (such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc). The systems are run through all the control system's sequences of operation and components are verified to be responding as the sequences state.

V. General Contractor: The prime contractor for this project.

W. Indirect Indicators: Indirect indicators are indicators of system response or condition provided y a Building Management System monitor (i.e. a damper position).

X. Manual Test: Manual tests are performed using hand-held instruments, immediate control system readouts or direct observation to verify performance.

Y. Mechanical Subcontractor: One of several installation contractors who are in the employ of the project General Contractor.

Z. Mechanical Engineer: The Mechanical Engineer is the consultant to the Project Architect who supervised preparation of the M series of contract drawings and specification Division 15 of the Contract Documents.

AA. Monitoring: The recording of parameters (flow, current, status, pressure, etc.) of equipment operation using datalogger or the trending capabilities of control systems.

BB. Phased Commissioning: Phased commissioning is commissioning completed in phases (i.e. by building floors or wind).

CC. Pre-functional Checklist: Pre-functional checklists are a list of component inspections and tests that verify proper installation of equipment.

1. Pre-functional checklists are primarily static inspections and procedures to prepare the equipment or system for initial operation (i.e. drive belt tension, oil levels check, labels affixed, gages in place, sensors calibrated, measuring voltage imbalance, and etc.).

2. Pre-functional checklists augment and are combined with the manufacturer's start-up checklist.

DD. Sampling: Sampling is a testing method wherein only a fraction of the total number of identical, or near identical, pieces of equipment are physically tested.

EE. Start-up: Start-up is the initial starting or activating of dynamic equipment, including executing pre-functional checklists.

FF. Test and Balance subcontractor: The firm or individual who subcontracts to balance the HVAC systems (i.e. ventilation and hydronic systems) within the project.

GG. Test Procedures: Test procedures are procedures prescribed by the Commissioning Contractor that specify the step-by-step process that must be executed to fulfill the test requirements.

1.08 SYSTEMS TO BE COMMISSIONED

A. The following systems shall be commissioned:

MECHANICAL SYSTEMS	MECHANICAL SYSTEMS	ELECTRICAL SYSTEMS
Chillers	Computer room units	Scheduled lighting controls
Pumps	Fume hoods	Daylight dimming controls
Boilers	Specialty fans	Lighting occupancy sensors
Piping Systems	Testing, Adjusting & Balancing	Power quality
Ductwork	Chemical treatment systems	Security system
Variable frequency Drivers	HVAC control systems	Standby power system
Air Handlers	Fire and smoke dampers	UPS system
Packaged air conditioning units	Fire sprinkler systems	Fire and smoke alarm
Terminal units (air)	Equipment sound control	Communications system
Unit heaters	Equipment vibration control	Public address/ Paging
Heat exchangers	Egress pressurization	Service Ground

OTHER SYSTEMS
Service Water Heaters

PART 2 – PRODUCTS

2.01 TEST EQUIPMENT

A. The General Contractor (through arrangements with it's subcontractors) shall provide all standard tools and testing equipment required o perform startup and initial checkout and required functional performance testing.

B. The General Contractor (through arrangements with it's subcontractors) shall provide special equipment, tools and instruments (i.e. special tools and equipment only available from vendor, specific to a piece of equipment) required for testing equipment.

C. The Commissioning Contractor shall provide stand-alone datalogging equipment that may be required of the Commissioning Plan.

D. All testing equipment provided by the General Contractor (through arrangements with it's subcontractors) shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the project documents. Unless otherwise noted within the contract documents, the following minimum requirements apply:

E. Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5 deg. F and a resolution of + or – 0.1 deg. F.

F. Pressure sensors shall have an accuracy of + or – 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year.

G. All equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged.

H. Calibration tags shall be affixed or certificates readily available.

PART 3 – EXECUTION

3.01 MEETINGS

A. Scoping Meeting: Within 90 days of commencement of construction, the Commissioning Contractor shall schedule, plan and conduct a commissioning scoping meeting with the entire commissioning team in attendance (the Commissioning Contractor will distribute meeting minutes to all parties). Meeting agenda shall be distributed and approved by attendees prior to meeting.

B. Miscellaneous Meetings: The Commissioning Contractor shall schedule additional commissioning coordination meeting, as well as meetings indeed to resolve deficiencies, as required of the efficient execution of the Commissioning Plan (the Commissioning Contractor will distribute meeting minutes to all parties.

3.02 REPORTING

A. Reporting: The Commissioning Contractor shall provide regular monthly progress reports to the Owner's Representative and copied to all member of the Commissioning Team. Additional reporting, as prescribed in the Commissioning Plan, shall also be provided the Owner's Representative and copied to all members of the Commissioning Team.

3.03 START-UP, PRE-FUNCTIONAL CHECKLISTS, AND INITIAL CHECKOUT

A. Commissioning: The following procedures apply to all equipment to be commissioned.

1. General: Each piece of equipment must be given a full pre-functional checkout. Sampling strategies may not be utilized during pre-functional checkout. The pre-functional resting fro a given system must be successfully completed prior to formal functional performance testing of equipment or subsystems of he given system. Pre-functional testing is the contractual responsibility of General Contractor (this responsibility is typically delegated to the installation subcontractor).

2. Specific parties responsible for pre-functional checklists and startup (i.e. installation subcontractor) shall be identified during the commissioning scoping meeting and in the checklist forms.

3. The primary role of the Commissioning Contractor in equipment startup process is to ensure that there is written documentation that each of the manufacturer recommended procedures have been completed.

4. Startup and Initial Checkout Plan: The Commissioning Contractor shall assist the commissioning team members responsible for equipment startup (i.e. installation subcontractor) in developing startup plans for all equipment. However, it is the responsibility of the installation subcontractor to submit the full startup plan to the Commissioning Contractor.

5. The Commissioning Contractor shall review and approve the test and startup procedures; noting any procedures that need to be added.

6. The Commissioning Contractor shall provide pre-functional checklists and tests to installation contractors.

7. All procedures for initial, intermediate and final test results shall be fully documented. Pre-functional checklists o other suitable forms, clearly referencing the procedures followed shall constitute documentation.

B. Sensor and Actuator Calibration: All field installed temperature, relative humidity, CO, CO2, and pressure sensors and gages, and all actuators (dampers and valves) on all equipment shall be calibrated using the methods described below. Alternate methods may be used, if approved by the Owner's Representative beforehand. All test instruments shall have had a certified calibration within the last 12 months. Sensors installed at the factory, and are provided with calibration certification, need not be field calibrated.

1. Sensor Calibration Methods: Verify that all sensors are appropriately located. Verify that sensors with shielded cable are properly grounded. For sensor pairs that are used to determine a temperature or pressure difference, insure they are reading within 0.2 deg. F. of each other for temperature, and within a tolerance equal to 2% of each other, for pressure. Tolerances for critical applications may be tighter.

2. Sensors Without Transmitters: Make a reading with a calibrated test instrument within 6 inches of the site of standard sensors. Verify that standard sensor reading (i.e. permanent thermostat, gage or building automation system (BAS)) is within the tolerances in the table below of the instrument-measured value.

3. Sensors With Transmitters: Connect a signal generator in place of sensor. Connect ammeter in series between transmitter and MAS control panel. Using manufacturer's resistance-temperature data, simulate minimum desired temperature. Adjust transmitter potentiometer zero until the ammeter reads 4 mA. Repeat for the maximum temperature matching 20mA to the potentiometer span or maximum and verify a the BAS. Record all values and recalibrate controller as necessary to conform to specified control ramps, reset schedules, proportional relationship, reset instrument within 6 inches of the site sensor. Verify that the sensor reading (via the permanent thermostat, gage or building automation system (BAS) is within the tolerances in the table below of the instrument-measured value. If not, replace sensor and repeat. For pressure sensors, perform a similar process with a suitable signal generator.

Sensor	Required Tolerance (+-)	Sensor	Required Tolerance(+-)
Cooling coil, chilled and condenser Water temps	0.4F	Flow rates, water	4% of design
AHU wet bulb or dew point	2.0F	Cumbustion flue temps	5.0F
Hot water coil and boiler water temp	1.5F	Oil flow rate	1% of design
Outside air, space air, duct air temps	0.4F	Steam flow rate	3% of design
Watthour, voltage & amperage	1% of design	Barometric pressure	0.1 in. of Hg
Pressure, air, water and gas	3% of design		
Flow rates, air	10% of design		

4. Critical Applications: For critical applications (process, manufacturing, etc.) more rigorous calibration techniques may be required for selected sensors. Describe any such methods used on an attached sheet.

3.04 EXECUTING PRE-FUNCTIONAL CHECKLISTS AND STARTUP

A. Notification: The Mechanical, Electrical, and Controls subcontractors shall provide at least four weeks notice to the Owner's Representative and Commissioning Contractor before scheduled startup and checkout of major equipment or systems

B. Responsibilities: Pre-functional checklists, startup and checkout shall be directed and executed by the installation contractor. When checking off pre-functional checklists, signatures are required of subcontractors as verification that work was completed satisfactorily.

1. The Mechanical, Electrical, and Controls subcontractors shall execute startup and provide the Commissioning Contractor with a signed and dated copy of the completed startup, pre-functional tests and inspections, and checklists.

2. Only individuals that have direct knowledge and witnessed that a line item task on the pre-functional checklist was actually performed shall initial or check that item off. It is not acceptable for witnessing supervisors to fill out these forms.

C. Observations: The Commissioning Contractor shall observe the procedures for each piece of primary equipment, unless there are multiple units, (in which case a sampling strategy may be used as approved by the Owner's Representative). In no case will the number of units witnessed be less than four on any one building, nor less than 20% of the total number of identical or very similar units.

1. For lower-level components of equipment, (e.g., VAV boxes, sensors, controllers), the Commissioning Contractor shall observe a sampling of he pre-functional and startup procedures. The sampling procedures are identified in the Commissioning Plan.

3.05 DEFICIENCIES, NON-CONFORMANCE AND APPROVAL IN CHECKLISTS AND STARTUP

A. The Mechanical, Electrical, and Controls subcontractors shall clearly list any outstanding items of the initial startup and pre-functional procedures that were not completed successfully. The Commissioning Contractor shall be notified of such deficiencies (Pre-functional Procedure Form) within two days of test completion.

B. The Commissioning Contractor shall review the Pre-functional Procedure Form report and note that the procedure, as documented, and submit either a form of non-compliance or an approval form to the installation subcontractor or Owner's Representative.

C. The Commissioning Contractor shall work with the appropriate subcontractors to correct and retest deficiencies or uncompleted test or startup items.

D. The Commissioning Contractor shall involve the Owner's Representative and others as necessary.

E. The installation subcontractor shall correct all areas that are deficient or incomplete in the checklists and tests in a timely manner, and shall notify the Commissioning Contractor as soon as outstanding items have been corrected and resubmit an updated startup report and a Statement of Correction on the original non-compliance report.

F. When satisfactorily completed, the Commissioning Contractor recommends approval of the execution of the checklists and startup of each system to the Owner's Representative using a standard form.

3.06 FUNCTIONAL PERFORMANCE TESTING

A. Objectives and Scope: The objective of functional performance testing is to demonstrate that each system is operating according to he documented design intent and Contract Documents. Functional testing facilitates bringing the system from a state of substantial completion to full dynamic operation. Additionally, during the testing process, areas of deficient

performance are identified and corrected, improving the operation and functioning of the systems.

B. This sub-section applies to all commissioning functional testing for all divisions. The general list of equipment to be commissioned is found in Section 17100, Part 1.8. The parties responsible to execute each test are listed and prescribed in Specification Divisions 15 and 16.

C. Each system shall be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load) where there is a specified system response. Verifying each sequence in the sequences of operation is required. Proper responses o such modes and conditions as power failure, freeze condition, low oil pressure, no flow, equipment failure, etc. shall also be tested. Specific modes required in this project are given and prescribed in Specification Division 15 and 16.

D. Development of Test Procedures: Before test procedures are written, the Commissioning Contractor shall obtain requested documentation and a current list of change orders affecting equipment or systems (including an updated points list, program code, control sequences and parameters). Using the testing parameters and requirements and prescribed in Specification Division 15 and 16 the Commissioning Contractor shall develop specific test procedures and forms to verify and document proper operation of each piece of equipment and system. Each installation subcontractor or vendor responsible to execute a test shall provide assistance to the Commissioning Contractor in developing the procedures review (answering questions about equipment, operation, sequences, etc.). Prior to execution, the Commissioning Contractor shall provide a copy of the test procedures to the installation subcontractor(s) who shall review the tests for feasibility, safety, equipment and warranty protection. The Commissioning Contractor may submit the tests to the architect and design engineers for review, if requested.

E. The purpose of any given specific test is to verify and document compliance with the stated criteria of acceptance given on the test form: The test procedure forms developed by the Commissioning Contractor shall include (but not be limited to) the following information:

1. System and equipment or component name(s)

2. Equipment location and ID number

3. Unique test ID number, and reference to unique pre-functional checklist and startup documentation ID numbers for the piece of equipment.

4. Date

5. Project name

6. Participating parties

7. A copy of the specification section describing the test requirements.

8. A copy of the specific sequence of operations or other specified parameters being verified.

9. Formulas used in any calculations

10. Required pre-test field measurements

11. Instructions for setting up the test.

12. Special cautions, alarm limits, etc.

13. Specific step-by-step procedures to execute the test, in a clear, sequential and repeatable format.

14. Acceptance criteria of proper performance with a Yes/No check box to allow for clearly marking whether or not proper performance of each part of the test was achieved.

15. A section for comments.

16. Signatures and date block for the Commissioning Contractor.

F. Certifications: Upon the completion satisfactory of each functional test, the Commissioning Contractor shall issue a Functional Performance Certification that attests to the satisfactory completion of specified startup and performance.

3.07 TEST METHODS

A. Functional performance testing and verification shall be achieved by manual testing) persons manipulate the equipment and observe performance) or by monitoring the performance and analyzing the results using the control system's trend log capabilities or be stand-alone datalogger. Specify which methods shall be used for each test as prescribed in Specification Divisions 15 and 16. With the approval of the Owner's Representative, the Commissioning Contractor may substitute alternative methods of testing, or recommend additional testing. In the event specific test methods are not listed, the Commissioning Contractor will determine which testing method is most appropriate.

B. Simulated Conditions: Simulated conditions shall be allowed, though timing the testing to experience actual conditions is encouraged wherever practical.

C. Overwritten Values: Overwriting sensor values to simulate a condition, such as overwriting he outside air temperature reading in a control system to be something other than it really is, shall be allowed, but shall be used with caution and avoided when possible. Such testing methods often can only test a part of a system, as the interactions and responses of other systems will be erroneous or not applicable. Simulating a condition is preferable to simulating multiple conditions. When overwriting values, sensors, transducers and devices shall have been calibrated.

D. Simulated Signals: Using a signal generator that creates a simulated signal o test and calibrate transducers and DDC constants is generally recommended over using the sensor to act as the signal generator via simulated conditions or overwritten values.

E. Altering Setpoints: Rather than overwriting sensor values, and when simulating conditions is difficult, altering setpoints to test a sequence is acceptable. For example, to see the AC compressor lockout work at an outside air temperature below 55 deg. F., when the outside air temperature is above 55 def. F., temporarily change the lockout setpoint to be 2F above the current outside air temperature.

F. Indirect Indicators: Relying on indirect indicators for response or performance shall be allowed only after visually and directly verifying and documenting, over the range of the tested parameters, than the indirect readings through the control system represent actual conditions and responses. Much of this verification is completed during pre-functional testing.

G. Setup: Each function and test shall be performed under conditions that simulate actual conditions as close as is practically possible. The installation subcontractor executing the test shall provide all necessary materials, system modifications, etc. to produce the necessary flows, pressures, temperatures, etc. necessary to execute the test according to the specified conditions. At completion of the test, the installation subcontractor shall return all affected building equipment and systems, due to these temporary modifications, to their pre-test condition.

H. Sampling: Multiple identical pieces of non-life-safety or otherwise non-critical equipment may be functionally tested using a sampling strategy. Significant application differences and significant sequence of operation difference in otherwise identical equipment invalidates their common identity. A small size or capacity difference, alone, does not constitute a difference. The specific recommended sampling rates are specified with each type of equipment and prescribed in Specification Division 15 and 16. It is noted that no sampling by the installation subcontractors is allowed in pre-functional checklist execution.

I. Coordination and Scheduling: The Mechanical, Electrical, and Controls subcontractors shall provide sufficient notice to the Commissioning Contractor regarding their completion schedule for the pre-functional checklists and startup of all equipment and systems. The Commissioning Contractor will schedule functional tests through the Owner's Representative, General Contractor and affected Mechanical, Electrical, and Controls subcontractors. The Commissioning Contractor shall direct, witness, and document the functional testing of all equipment and systems. The installation subcontractors shall execute the tests.

J. Functional testing shall be conducted after pre-functional testing and startup has been satisfactorily completed. The control system is sufficiently tested and approved by the Commissioning Contractor before it is used for Test and Balance Contractor or to verify performance of other components or systems. The air balancing and water balancing is completed and debugged before functional testing of air-related or water-related equipment or systems. Testing proceeds from components to subsystems to systems. When the proper performance of all interacting individual systems has been achieved, the interface or coordinated responses between systems is checked.

3.08 DOCUMENTATION, NON-CONFORMANCE AND APPROVAL OF TESTS

A. Documentation: The Commissioning Contractor shall witness and document the results of all functional performance tests using the specific procedural forms developed for that purpose. Prior to testing, these forms shall be provided to the Owner's Representative for review and approval and to the Mechanical, Electrical, and Controls subcontractors for review.

B. Non-Conformance

1. The Commissioning Contractor will record the results of the functional test on the procedure or test form. All deficiencies or non-conformance issues shall be noted and reported to the Owner's Representative on a standard non-compliance form.

2. Corrections of minor deficiencies identified may be made during the tests at the discretion of the Commissioning Contractor. In such cases the deficiency and resolution will be documented on the procedure form.

3. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures.

4. As tests progress and deficiencies are identified, the Commissioning Contractor shall discuss the issue with the General Contractor and the installation subcontractor. When there is no dispute on the deficiency and the installation subcontractor accepts responsibility to deficiencies:

a. The Commissioning Contractor documents the deficiency and the installation subcontractor's response and intentions and they go on to another test or sequence.

b. After the day's work, the Commissioning Contractor submits the non-compliance reports to the Owner's Representative (a copy shall be provided to the installation subcontractor).

c. Upon correction of the deficiency he installation subcontractor corrects the deficiency, signs the statement of correction a he bottom of the non-compliance form certifying that the equipment is ready to be retested and send it back to the Commissioning Contractor.

d. The Commissioning Contractor re-schedules the test and the test is repeated.

5. If there is a dispute about a deficiency, regarding whether it is a deficiency or who is responsible:

a. The deficiency shall be documented on the non-compliance form with the installation subcontractor's response and a copy given to the Owner's Representative, the General Contractor and installation subcontractor.

b. Resolutions are made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive authority vested in the Owner's Representative

c. The Commissioning Contractor documents the resolution process.

d. Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency, signs the statement of correction o the non-compliance form and provides it to the Commissioning Contractor. The Commissioning Contractor re-schedules the test and the test is repeated until satisfactory performance is achieved.

3.09 WRITTEN WORK PRODUCTS

A. The commissioning process generates a number of written work products. The Commissioning Plan shall list all the formal written work products, describes briefly their contents and their scheduled due dates. The schedule for delivery of these documents is specified in Section 1.6 of this Specification. In summary, these written products of the work are listed below:

1. Draft Commissioning Plan
2. Final Commissioning Plan
3. Meeting Minutes
4. Commissioning Schedules
5. Pre-functional Checklists (all systems & equipment to be commissioned).
6. Pre-functional Procedure Form
7. Issues log (deficiencies & Non-conformance notifications)
8. Commissioning Progress Reports

9. Deficiency Reports
10. Functional Test Forms
11. Completed Functional Tests Forms
12. Functional Performance Certifications
13. Commissioning Record Book
14. Final Commissioning Report
15. Miscellaneous Approvals

END OF SECTION

SECTION 02465
TIMBER PILE FOUNDATIONS

PART 1 - GENERAL

1.01 WORK INCLUDES

A. Survey and Layout for Pile Placement

B. Drilling for Pile Placement

C. Dewater and/or Casing (as required)

D. Timber Piling

E. 2-1/2" Galvanized Pipe (sealed each end) at each Pile

F. Slurry Backfill

G. Thermistors and Freezeback Monitoring

H. Pile Treatment Process (as required)

I. Refrigeration (as required)

J. Record of Placement

1.02 REFERENCES

A. American Wood Preservers Association

1. AWPA Standard M2 – Standards for Inspection of Treated Timber Products

2. AWPA Standard M3 – Standard Quality Control Procedures for Wood Preserving Plants

3. AWPA Standard P8 – Standards for Oil-Borne Preservatives

4. AWPA Standard P9 – Standards for Solvents for Organic Preservative Systems

1.03 SUBMITTALS

A. Timber Piles

1. Submit certificate providing piling length, size, species, and grade.

2. Submit notarized certificate of compliance of treatment process to AWPA standards.

B. Record of Placement shall be maintained providing the following:

1. Drilling logs of materials including ice encountered

2. Depth of augured hole

3. Layout dimensions

4. Record of temperatures over twelve hours until freezeback has occured, plus 48 hours

1.04 QUALITY ASSURANCE

A. The Contractor shall be responsible to accurately layout the control points for all work on the site. Contractor shall keep accurate notes and data on the work and shall, at the completion of the work, certify that the work is constructed in accordance with the Drawings and submit as-built drawing.

PART 2 - PRODUCTS

2.01 PRESSURE TREATED TIMBER PILES AND BACKFILL

A. Material:

1. Pressure treated Timber piling shall be square No. 1, Douglas Fir or an approved substitute. Square piles shall be as shown on the Drawings.

B. Backfill:

1. Sand and water shall be used to form the slurry backfill. The gradation of the sand shall be as follows:

U.S. Standard Sieve Size	Percent Fines by Weight
As Outlined in Geotechnical Engineering Report	As Outlined in Geotechnical Engineering Report

C. Active Layer Backfill:

As outlined in Geotechnical Engineering Report.

D. Thermistors:

1. Provide 7 Yellow SpringsYSI-44034 (or an approved substitute) thermistors. Strings shall be fabricated to avoid overheating damage to the thermistors and sealed water-tight. Thermistors shall be provided on 10% of total number of piles.

2. Provide ice bath calibration and certification letter from the fabricator.

3. Each thermistor string shall be a full length of pile cable with 5 thermistors spaced at 5 foot centers over the lower 20 feet of the pile. Thermistor readings will be obtained by placing the thermistor string in the 2 ½ inch steel pipe.

4. Permanent locations of thermistor shall be as outlined in the Engineering Geotechnical Report.

E. Pile Access Pipe

1. 2-1/2" Schedule 40 galvanized steel pipe with cap both ends, all piling.

2.02 WOOD TREATMENT (If required – Refer to General Note 4)

A. Pressure treatment shall be a non-toxic non-salt-based preservative treatment conforming to AWPA Standards.

B. Pressure treated piling shall be pressure impregnated by the closed cylinder vacuum pressure method as described in the latest standards of the AWPA.

C. The preservative carrier shall conform to AWPA Standard P9, Hydrocarbon Solvent Type A or Type C. The active ingredient shall be Copper Napthenate and shall conform to the AWPA Standard P8.

D. Preservative retentions shall conform to AWPA and at a minimum shall be 0.80 pounds per cubic feet for piling in contact with soil or fresh water, and 2.5 pounds per cubic feet for piling in contact with salt water.

E. All treated materials shall carry a supplier stamp or inspection agency mark certifying compliance with the AWPA requirements.

E. All cuts, holes and injuries to the surface of the treated material shall be field protected by applying two coats of Copper Napthenate solution to the affected area.

PART 3 - EXECUTION

3.01 TIMBER PILE PLACEMENT

A. Placement:

1. Timber piles shall be set in the locations and within the tolerances of ½" vertical and 1" horizontal.

2. Augering: Use augering equipment of proper size. Augered hole diameter shall be at least 6" inches larger than the greatest diagonal dimension.

3. Auger holes to a depth equal to the required pile penetration depth at each location. Dispose of all material from the augered holes at an approved location.

4. Setting Piles: Set piles at the required penetration depths, in locations indicated on the Drawings. After placement, "tap" each pile with sufficient force to ensure proper seating in the bottom of the hole.

5. Prevent floating of pile during placement of slurry backfill.

B. Backfill:

1. The amount of water added to the granular soils in forming the slurry backfill shall be kept to a minimum to limit the heat release to the surrounding permafrost during freezing. Slurry material with a 5-inch slump (maximum) shall be placed in 3 to 4 foot lifts, and each lift must be thoroughly densified with a concrete vibrator. Densification of the slurry must be carefully accomplished to prevent segregation of soil and water. It may be necessary to allow freezeback of the first several feet of slurry before the remainder is placed to prevent floatation of timber piles. In addition, care must be exercised to prevent slurry buildup on the upper portion of the pile and hole sidewall. Brackish water could significantly reduce allowable pile capacity and shall not be used.

2. The Contractor shall provide mechanical refrigeration if the freezeback cannot be achieved naturally.

3. The mixing of the slurry backfill shall be accomplished in a mixer at the surface. Mixing in the augered hole will not be allowed.

4. Piles shall be set and backfilled immediately after each hole is augered.

C. Monitoring:

1. Calibrated thermistor strings shall be used to verify the time of refreeze of all piles.

2. No pile shall be loaded until the slurry temperature in the bottom half of the hole has dropped below 31.5 degrees F.

3. The pile load shall not exceed 10 kips until the average temperature along the piling is 31 degrees F.

4. Thermistors shall be installed in locations as outlined in the Geotechnical Engineering Report.

D. Active Layer Backfill:

1. Grease the top of the piling from 6 inches above finish grade to 6 inches below the active layer.

2. The top of the piling shall be wrapped with 3 wraps of 10 mil visqueen from 6 inches above finish grade to 6 inches below the active layer.

3. Backfill active layer portion of the augered hole as outlined in the Geotechnical Engineering Report.

E. Drainage:

1. Grade area under building to provide drainage away from the structure. Do not allow water in augered hole.

F. Pile Access Pipes:

1. 2-1/2” (minimum) Schedule 40 galvanized pipe shall be clamped securely to wood pile at top and bottom and two intermediate locations.

2. Threaded fittings and caps for access pipes shall be doped and securely tightened to be water tight.

G. Protection and Restrictions:

1. Protection of Roads: Contractor shall be responsible for maintaining the roads he uses during construction by patching as required to keep them in the same condition as they were prior to use by the Contractor.

2. Restrictions Relating to Tundra: Vehicles or equipment may not be operated on unfrozen tundra without an approved method of protection. All traffic will be restricted to the established roads during this period. During months when the active zone is thawed, extreme care must be used to avoid disturbance of the relatively thin tundra mantle.

3. Approved Method of Protection of Tundra: Gravel or sand pads for construction vehicles and traffic.

4. If thawed ground over four feet deep or subsurface ice is encountered over one foot thick, stop work on that hole and notify the appropriate authority immediately. Continue working on remaining holes.

5. Provide five working days notice in advance of boring operations.

6. Provide casing as required to seal off surface water and seepage through the active zone.

7. Any depressions or ponds in the immediate area of the proposed structures shall be filled to prevent water from ponding beneath the building and around the piling.

END OF SECTION

General Notes:

1. Foundations for all projects shall be designed and constructed in accordance with a Geotechnical Engineering Report prepared by an engineer licensed in the State of Alaska.

2. *In areas of marginal permafrost (30 degree F.), and as described in the Geotechnical Report provision shall be made to accommodate future subsurface cooling devises in consideration of global warming trends.*

3. *Additional considerations for Timber Pile Foundations include:*

   a. *Surface fill to enhance drainage*

   b. *Insulation of ground surface to assist in maintaining sub-surface temperatures.*

4. *Field treatment of timber piles in the active layer with untreated portion of pile in the frozen soils is sometimes preferable in areas of marginal permafrost. Salt content in some preservative could depress the freezing temperature of soils.*

5. *Steel piles may be substituted for wood piles depending on engineering requirements and for Type I and Type II buildings.*

6. *If steel piles are used in permafrost with saline soils the pile may require helix shear rings for added capacity.*

SECTION 03300
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 WORK INCLUDES

A. Concrete Materials

B. Admixes

C. Reinforcing Steel

D. Accessories

1.02 REFERENCE STANDARDS

A. American Concrete Institute (ACI)

1. ACI 301 – Structural Concrete for Buildings.

2. ACI 302 – Recommended Practice for Concrete Floor and Slab Construction.

3. ACI 304 – Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.

4. ACI 306 – Recommended Practice for Cold Weather Concreting. ANSI 168.1 – Practice for Curing Concrete.

5. ACI 315 – Manual Standard Practice.

6. ACI 318 – Building Code Requirements for Reinforced Concrete.

7. ACI 347 – Recommended Practice for Concrete Formwork.

B. American Society for Testing and Materials (ASTM)

1. ASTM A 615 – Welded Steel Wire Fabric for Concrete Reinforcement.

2. ASTM C 33 – Concrete Aggregates.

3. ASTM C 94 - Ready-Mixed Concrete.

4. ASTM C 150 – Portland Cement.

5. ASTM C 260 – Air Entraining Admixtures for Concrete.

6. ASTM C 494 – Chemical Admixtures for Concrete.

7. ASTM A 615 – Deformed and Plain Billet Steel Bars for Concrete.

C. Concrete Reinforcing Steel Institute (CRSI)

1. CRSI 63 – Recommended Practice for Placing Reinforcing Bars.

2. CRSI 65 – Recommended Practice for Placing Bar Supports, Specifications, and Nomenclature.

1.03 SUBMITTALS

A. Shop Drawings detailing fabrication, bending, and placement.

B. Material certificates signed by product manufacturers certifying that product complies with requirements.

C. Product Data: For each type of manufactured material and product indicated.

D. Design Mixes: For each concrete mix.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed concrete work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

C. Source Limitations: Obtain each type of cement of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.

D. Comply with ACI 301, "Specification for Structural Concrete," including the following, unless modified by the requirements of the Contract Documents.

1. General requirements, including submittals, quality assurance, acceptance of structure, and protection of in-place concrete.

2. Formwork and form accessories.

3. Steel reinforcement and supports.

4. Concrete mixtures.

5. Handling, placing, and constructing concrete..

PART 2 - PRODUCTS

2.01 CONCRETE MATERIALS

E. Cement: Portland Type, ASTM C 150, Type I or Type III.

F. Fine and Coarse Aggregates: ASTM C 33.

G. Water: Clean and free from injurious amounts of oil, alkali, organic matter or other deleterious material.

2.02 ADMIXTURES

A. Air Entrainment: ASTM C 260.

B. Chemical: ASTM C 494, Type A - Water Reducing.

2.03 REINFORCING

A. Reinforcing Steel: 60 grade, deformed billet steel bars, ASTM 615, plain finish.

B. Welded Steel Wire Fabric: 60 grades plain type, ASTM A 185 in flat sheets: plain finish.

C. Fabricate concrete reinforcing in accordance with ACI 315.

H. Locate reinforcing splices, not indicated on drawings, at points of minimum stress.

2.04 ACCESSORY MATERIALS

A. Tie Wire: Minimum 16 gage annealed type, or patented system accepted by the authority having jurisdiction.

B. Chairs, Bolster, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcing during construction conditions.

2.05 CONCRETE MIX

A. Mix in accordance with ASTM C 94.

B. Provide concrete of the following strength:

1. Compressive strength 3,000 psi @ 28 days.
2. Type I and Type III concrete as required by engineering criteria.
3. Higher compressive strength as required by engineering criteria.

C. Select proportions for normal weight concrete in accordance with ACI 301, 3.8. Add air entraining agent to concrete to entrain air as indicated in ACI 301 Table 3.4.1.

D. Use accelerating admixtures in cold weather only when accepted by the authority having jurisdiction. If accepted, use of admixtures will not relax cold weather placement requirements. Calcium chloride may not be used.

E. Add air entraining agent to concrete mix for concrete work exposed to the exterior.

PART 3 EXECUTION

3.01 PLACING CONCRETE

A. Before placing concrete, ensure reinforcing is clean, free of loose scale, dirt, or other foreign coatings which would reduce bond to concrete. Insure that Reinforcing is supported and secured against displacement. Do not deviate from true alignment.

B. Place concrete in accordance with ACI 304.

C. Ensure anchors, seats, plates, and other items to be cast into concrete are placed, held securely, and will not cause hardship in placing concrete.

D. Maintain records of poured concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

E. Ensure reinforcement, inserts, embedded parts, formed expansion and contraction joints, are not disturbed during concrete placement.

F. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent. Apply bonding agent in accordance with manufacturer's recommendations.

G. Pour concrete continuously between predetermined construction and control joints.

H. Excessive honeycomb or embedded debris in concrete is not acceptable.

I. Conform to ACI 306 when concreting during cold weather.

3.02 REINFORCING STEEL

A. Reinforcing steel shall be fabricated and placed in accordance with ACI 315 and CRSI Standards for detailing and placing. Clearance requirements:

3.03 SCREEDING

A. Screed slabs-on-fill, maintaining surface flatness of maximum 1/8 inch in 10 feet.

3.04 PATCHING

A. Patch imperfections.

3.05 DEFECTIVE CONCRETE

A. Modify or replace concrete not conforming to required lines, details, and elevations.

B. Repair or replace concrete not properly placed resulting in excessive honey combing and other defects.

3.06 CONCRETE FINISHING

A. Rough Formed Finishes: Provide standard form finish to all concrete formed surfaces that are to be concealed in the finish work or by other construction.

B. Smooth-Formed Exposed Finish: Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch in height.

C. Floor Slabs: Floors shall be provided with a finished concrete surface in accordance with requirements of manufacturer of the scheduled floor material finish

3.07 CURING AND PROTECTION

A. Beginning immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury. Maintain concrete with minimal moisture loss at relatively constant temperature for a period necessary for hydration of cement and hardening of concrete.

END OF SECTION

General Notes

1. *Concrete mix shall be in accordance with criteria as established by an engineer licensed in the State of Alaska for specific project requirements and conditions.*

2. *Careful considerations shall be given to use of concrete in remote areas relative to cost/benefit.*

3. *In rural areas where concrete is not a common building material it is important to require a sample of the finished product for approval to set the standard for the in-place work.*

4. *Do not include calcium chloride in the concrete mix for concrete exposed to saltwater.*

5. *If low porosity is a project requirement this may be enhanced by using 6 to 7 sack mix and a wet cure method for 7 days minimum.*

6. *Coordinate surface treatment of concrete floors for compatibility with the specified floor finish (i.e. VAT, sheet vinyl, epoxy coatings, etc.).*

7. *Special inspections are often overlooked for remote construction sites. The owner or the registered design professional is responsible for ensuring that these inspections are conducted in accordance with the International Building Code, Chapter 17.*

SECTION 03410
PRECAST ARCHITECTURAL CONCRETE

PART 1 - GENERAL

1.01 WORK INCLUDES

A. Precast Architectural Concrete, including Prestressed Concrete

1.02 REFERENCE STANDARDS

A. ACI International (ACI)

1. ACI 211.1 – Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.

2. ACI 211.2 – Standard Practice for Selecting Proportions for Structural Lightweight Concrete.

3. ACI 318/318 R – Building Code Requirements for Structural Concrete and Commentary.

4. ACI SP 66 – ACI Detailing Manual

B. American Welding Society (AWS)

1. AWS D1.1 / D1.1MSTM A 615 – Structural Welding Code – Steel.

C. American Society for Testing Materials (ASTM)

1. ASTM A 416 – Steel Strand, Uncoated Seven-Wire for Pre-stressed Concrete.

2. ASTM C 1017 – Chemical Admixture for Use in Producing Flowing Concrete.

3. ASTM C 494 – Chemical Admixture for Concrete.

D. Precast/Pre-stressed Concrete Institute (PCI)

1. PCI MNL 116 - Quality Control for Plants and Production of Structural Precast Concrete Products.

2. PCI MN L 117 – Quality Control for Plants and Production of Architectural Precast Concrete Products.

3. MNL 122 – Architectural Precast Concrete.

1.03 SUBMITTALS

A. Shop Drawings:

1. Detail drawings showing details in accordance with ACI SP 66, and ACI ACI 318, including installation details. Detail drawings shall indicate separate identification marks for each different precast unit, location of units in the work, elevations, fabrication details, welding details, reinforcement, connections, dimensions, interface with adjacent members, blocking points for units stored at the precast concrete plant or at the jobsite, lifting points and special handling instructions in sufficient detail to cover manufacture, handling and erection.

B. Product Data:

1. Design Calculations, prior to the manufacture of any precast architectural concrete units for the project.

2. Mix Design; G, a statement on the mix design formula, as specified.

3. Manufacturer's Qualifications: A statement giving the qualifications of the precast concrete manufacturer and of the installers, prior to commencing operations.

C. Test Reports:

1. Certified copies of test reports including all test data and all test results. Test for compressive strength of concrete shall be performed by an approved independent commercial testing laboratory, except that compressive strength tests for initial prestress may be performed in the manufacturer's plant laboratory.

1.04 GENERAL REQUIREMENTS

A. Precast concrete units shall be designed and fabricated by an experienced and acceptable precast concrete manufacturer. The manufacturer shall have been regularly and continuously engaged in the manufacture of precast concrete work similar to that indicated on the drawings for at least 3 years. The Contractor shall submit a statement detailing the Manufacturer's Qualifications as specified in the Submittals paragraph. Precast work shall be coordinated with the work of other trades.

1. Precast concrete units design shall conform to ACI 318, and PCI MNL 122. Design loads for precast concrete shall be as indicated on the drawings. Stresses due to restrained volume change caused by shrinkage and temperature differential, handling, transportation and erection shall be accounted for in the design.

B. Connections:

1. Connection of units to other members, or to other units shall be of the type and configuration indicated. The design and sizing of connections for all design loads shall be by the Contractor.

C. Concrete Strength:

1. Precast concrete units shall have a 28 day compressive strength of 5,000 psi.

D. Concrete Proportion:

1. Selection of proportions for concrete shall be based on the methodology presented in ACI 211.1 for normal weight concrete and ACI 211.2 for lightweight concrete. The concrete proportion shall be developed using the same type and brand of cement, the same type and gradation of aggregates, and the same type and brand of admixture that will be used in the manufacture of precast concrete units for the project. Calcium chloride shall not be used in precast concrete and admixture containing chloride ions, nitrates, or other substances that are corrosive shall not be used in prestressed concrete.

2. Calculations for design of members and connections not shown shall be made by a professional engineer licensed in the State of Alaska and experienced in the design of precast architectural concrete. Calculation shall include the analysis of member for lifting stresses and the sizing of the lifting inserts.

3. Mix Design: The Contractor shall submit the mix design formula giving the maximum nominal coarse aggregate size, the proportions of all ingredients and the type and amount of any admixtures that will be used in the manufacture of each strength and type of concrete, prior to commencing operations. The statement shall be accompanied by test results from an approved testing laboratory, certifying that the proportions selected will produce concrete of the properties required. No substitutions

shall be made without additional tests to verify that the concrete properties are satisfactory.

1.05 STORAGE AND INSPECTION AT MANUFACTURER'S PLANT

A. Precast units temporarily stored at the manufacturer's plant shall be protected from damage in accordance with PCI MNL 116, PCI MNL 117, and PCI MNL 122. Immediately prior to shipment to the jobsite, all precast concrete units shall be inspected for quality to insure all precast units conform to the requirements specified. Inspection for quality shall include, but shall not necessarily be limited to, the following elements: color, texture, dimensional tolerances, chipping, cracking, staining, warping and honeycombing. All defective precast concrete units shall be replaced or repaired as approved.

1.06 DELIVERY HANDLING AND STORAGE

A. Precast units shall be handled in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.01 MATERIALS

Except as otherwise specified, material shall conform to Section 03300, Cast-in-Place Concrete.

A. Aggregates

1. Aggregates shall be in accordance with design requirements.

B. Reinforcing Steel

1. Reinforcing steel shall be galvanized if clearance to an exterior face is one inch or less.

C. Prestressing Strands

1. Prestressing stands shall conform to ASTM A 416 / A 416 M.

D. Tie Wire

1. Tie wire shall be soft monel or 18-8 stainless steel.

E. Inserts

1. Inserts shall be manufacturer's standard, suited for the application.

F. Plates, Angles, Anchors and Embedments

1. Material that do not require field welding shall be as specified in PCI MNL 117. Steel items, other than stainless, shall be coated with a rust-inhibiting paint or shall be hot-dip galvanized. Steel items, including items embedded in concrete, shall be either stainless steel or hot dip galvanized steel.

2. Material that requires field welding shall be in accordance with design requirements and shall be coated with a rust-inhibiting paint after welding.

G. Form Release Agent

1. Release agent shall be manufacturer's standard nonstaining type.

H. Admixture

1. Admixture shall conform to ASTM C 494 / C 494 M. Plasticizing admixture, if used, shall conform to ASTM C 1017 / C 1017 M.

2.02 PRECAST CONCRETE UNITS

A. General

1. Precast concrete ;units shall be manufactured and cured in accordance with the applicable provisions of PCI MNL 116 and PCI MNL 117. Units shall be manaufactured within the allowable tolerances given in PCI MNL 116, PCI MNL 117, and PCI MNL 122.

B. Formwork

1. Forms shall be steel of adequate thickness, braced, stiffened, anchored and aligned to produce precast architectural concrete units within required dimensional tolerances. Forms shall be sufficiently rigid to provide dimensional stability during handling and concrete placement and consolidation. Fiberglass-reinforced plastic, plastic coated wood, elastomeric or other nonabsorptive material shall be used for making tight joints and rustication pieces.

C. Reinforcement

1. Fabrication and placement of reinforcement shall conform to the details shown on the approved detail drawings and PCI MNL 116 and PCI MNL 117.

D. Embedded Accessories

1. Anchors, inserts, lifting devices, and other accessories which are to be embedded in the precast units shall be furnished and installed in accordance with the approved detail drawings. Embedded items shall be accurately positioned in their designed location, and shall have sufficient anchorage and embedment to satisfy design requirements.

E. Stripping

1. Precast concrete units shall not be removed from forms until units develop sufficient strength to safely strip the formwork and to remove the precast concrete units from the forms to prevent damage to the units from overstress or chipping.

F. Identification

1. Each precast concrete unit shall be marked to correspond to the identification marks for each different precast unit shown on the detail drawings.

G. Finishes

1. In accordance with design requirements.

PART 3 - EXECUTION

3.01 ERECTION

A. Precast units shall be erected in accordance with the detail drawings and without damage to other units or to adjacent members. Units shall be set true to alignment and level, with joints properly spaced and aligned both vertically and horizontally. Erection tolerances shall be in accordance with the requirements of PCI MNL 117 and PCI MNL 122. As units are being erected, shims and wedges shall be placed as required to maintain correct alignment. After final attachment, precast units shall be grouted as shown. After erection, welds and abraded surfaces of steel shall be cleaned and touched-up with a zinc-rich paint. Welds shall be made by a

certified welder in accordance with the manufacturer's erection drawings. Pickup points, boxouts, inserts, and similar items shall be finished to match adjacent areas after erection. Erection of precast units shall be supervised and performed by workmen skilled in this type of work. Welding and the qualifications of welders shall be in accordance with AWS K 1.1 / D 1.1 M.

3.02 CLEANING

A. Not sooner than 72 hours after joints are sealed, faces and other exposed surfaces of precast concrete discolored during erection shall be cleaned to remove dirt and stains by dry scrubbing with a stiff fiber brush, wetting the surface and vigorous scrubbing of the finish with a stiff fiber brush followed by additional washing, or by chemical cleaning compounds such as detergents or other commercial cleaners. Commercial cleaners shall be used in accordance with the manufacturer's recommendations. Cleaning procedure shall be performed on a designated test area and shall be approved prior to proceeding with cleaning work. Discolorations which cannot be removed by these procedures will be considered defective work. Cleaning work shall be done when temperature and humidity permit surfaces to dry rapidly. Adjacent surfaces shall not be damaged during cleaning operations.

3.03 PROTECTIVE WORK

A. Precast units shall be protected against damage from subsequent operations.

3.04 DEFECTIVE WORK

A. Precast concrete units damaged during erection shall be repaired as soon after occurrence as possible or replaced, as directed, using approved procedures. All repairs to precast concrete units shall match the adjacent surfaces in color and texture and shall be as approved. Unless otherwise approved, repair procedures shall conform to PCI MNL 116 and PCI MNL 117.

END OF SECTION

General Notes

1. Concrete mix for precast concrete shall be in accordance with criteria established by an engineer licensed in the State of Alaska for specific requirements and conditions.

2. Careful considerations shall be given to use of concrete in remote areas relative to cost/benefit.

3. Do not include calcium chloride in concrete mix for precast concrete that may be exposed to salt water.

4. *Special inspections are often overlooked for remote construction sites. The owner or the registered design professional is responsible for ensuring that these inspections are conducted in accordance with the International Building Code, Chapter 17.*

SECTION 04810
UNIT MASONRY ASSEMBLY

PART 1 - GENERAL

1.01 WORK INCLUDES

A. Concrete Masonry Units

B. Prefaced Concrete Masonry Units

C. Concrete Building Brick

D. Face Brick

E. Building Brick

F. Glazed Structural – Clay Facing Tile

G. Mortar and Grout

H. Steel Reinforcing Bars

1.02 REFERENCE STANDARDS

A. American Concrete Institute (ACI)

1. ACI 315 – Manual Standard Practice.

B. American Society for Testing and Materials (ASTM)

1. ASTM A 82 – Steel Wire, Plain, for Concrete Reinforcement.

2. ASTM A 153 – Zinc Coating (hot Dip) on Iron and Steel Hardware.

3. ASTM A 617 – Axle-Steel Deformed and Plain Bars for Concrete Reinforcement.

4. ASTM A 653 – Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

5. ASTM C 55 – Concrete Brick.

6. ASTM C 62 – Building Brick (Solid Masonry Units made from Clay or Shale).

7. ASTM C 67 – Test Methods for Sampling and Testing Brick and Structural Clay Tile.

8. ASTM C 90 – Load-Bearing Concrete Masonry Units.

9. ASTM C 91 – Masonry Cement.

10. ASTM C 126 – Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units.

11. ASTM C 140 – Test Methods of Sampling and Testing Concrete Masonry Units.

12. ASTM C 143 – Test Method for Slump of Hydraulic Cement Concrete.

13. ASTM C 150 – Portland Cement.

14. ASTM C 207 – Hydrated Lime for Masonry Purposes.

15. ASTM C 216 – Facing Brick (Solid Masonry Units Made from Clay or Shale).

16. ASTM C 270 – Flat Asbestos-Cement Sheets.

17. Aggregates for Masonry Grout.

18. ASTM C 476 – Grout for Masonry.

19. ASTM C 494 – Chemical Admixtures for Concrete.

20. ASTM C 744 – Prefaced Concrete and Calcium Silicate Masonry Units.

21. ASTM C 1019 – Test Method for Sampling and Testing Grout.

22. ASTM C 1142 – Extended Life Mortar for Unit Masonry.

23. ASTM C 1329 – Mortar Cement.

24. ASTM E 119 – Fire Tests of Building Construction and Materials.

1.03 SUBMITTALS

A. Shop Drawings: For masonry reinforced bars; comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.

1. Samples showing the full range of colors and textures available for exposed masonry units and colored mortars (if applicable).

2. Material Test Reports: From a qualified testing agency, for each type of masonry unit required; mortar complying with property requirements, and grout complying with compressive strength requirements.

3. Material Certificates: For each type of masonry unit required.

B. Preconstruction Testing Service: Engage a qualified independent testing agency to perform the following preconstruction testing:

1. Clay Masonry Units: For each clay masonry unit indicated, per ASTM C67

2. Concrete Masonry Units: For each concrete masonry unit indicated, per ASTM C 140.

3. Mortar: For mortar properties per ASTM C 270

4. Grout: For compressive strength per ASTM C 1019

C. Fire-Resistance Ratings: Where indicated, provide materials and ASTM E 119 by testing and inspecting agency, by equivalent concrete masonry

thickness, or by another means, as acceptable to authorities having jurisdiction. Submit piling length, size, species, and grade for approval.

D. Sample Panels: Build sample panels, to verify selections made under sample Submittals and to demonstrate aesthetic effects, for each type of exposed unit masonry assembly in sizes approximately 48 inches long by 48 inches high by full thickness.

E. Cold-Weather Requirements: Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions.

Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 60 and Section 2104.3 of the Uniform Building Code.

F. Hot-Weather Requirements: When ambient temperature exceeds 100 deg F, or 90 deg. F with a wind velocity greater than 8 mph, do not spread mortar beds more than 48 inches ahead of masonry units within one minute of spreading mortar.

PART 2 - PRODUCTS

2.01 GENERAL

A. Color and Texture: In accordance with design requirements.

B. Concrete Masonry Units: ASTM C90 and International Building Code Standard 21-4 and as follows:

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength in accordance with design requirements.

2. Weight Classification: In accordance with design requirements.

3. Exposed Face of Decorative Units: In accordance with design requirements.

4. Provide special shapes for lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.

C. Prefaced Concrete Masonry Units: Normal weight concrete units indicated below with manufacturer's standard smooth resinous tile facing, complying with ASTM C744:

1. For concrete masonry units to which prefaced surfaces are applied, provide ASTM C 90, International Building Code Standard 21-4.

2. Size: Manufactured with prefaced surfaces having 1/16-inch. wide returns of facing to create ¼ inch wide mortar joints with modular coursing.

3. Provide special shapes for lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.

D. Concrete Building Brick: ASTM C 55, International Building Code Standard 21-3, and as follows:

1. Unit Comprehensive Strength: Provide units with minimum average net-area comprehensive strength of in accordance with design requirements.

2. Weight Classification: In accordance with design requirements.

E. Face Brick: ASTM C216 in accordance with design requirements.

1. Unit Comprehensive Strength: Provide units with minimum average net-area comprehensive strength of in accordance with design requirements.

2. Initial Rate of Absorption: Less than 30 sq. in. per minute when tested per ASTM C67.

3. Efflorescence: Provide brick that has been tested according to ASTM C67 and is rated "not effloresced."

4. Surface Coloring: In accordance with design requirements.

F. Building (Common) Brick: ASTM C62 and International Building Code Standard 21-1, Grade in accordance with design requirements.

1. Unit Comprehensive Strength: Provide units with minimum average net-area comprehensive strength of in accordance with design requirements.

2. Size: In accordance with design requirements.

G. Glazed Structural-Clay Facing Tile: ASTM C 126, Grade in accordance with design requirements.

1. Type I (single-faced units), where only one finished face is exposed when units are installed.

2. Size: In accordance with design requirements.

3. Provide special shapes where required for corners, jambs, coved bases, sills, and other special conditions indicated.

4. Provide multicored units designed for use in reinforced, grouted masonry.

H. Mortar and Grout Materials: As follows:

1. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction.

2. Hydrated Lime: ASTM C 207, and International Building Code Standard 21-13, Type S

3. Mortar Cement: ASTM C 1329, and International Building Code Standard 21-14

4. Masonry Cement: ASTM C91, and International Building Code Standard 21-11

5. For pigmented mortar, use a colored cement or cement-lime formulation as required o produce the color indicated.

6. Aggregate for Mortar: ASTM C 144; except for joints less than ¼ inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.

a. Colored-Mortar Aggregates: Natural-colored sand or ground marble, granite, or other sound stone; of color necessary to produce required mortar color.

7. Aggregate for Grout: ASTM C 404

8. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.

9. Epoxy Pointing Mortar: ASTM C 395, epoxy-resin-based material formulated for use as pointing mortar for structural-clay tile facing units.

10. Cold-Weather Admixture: Non-chloride, non-corrosive, accelerating admixture complying with ASTM C 494, Type C, and recommended by the manufacturer for use in masonry mortar of composition indicated.

11. Water: Potable

I. Steel Reinforcing Bars: ASTM A 617, Grade 60

J. Ties and Anchors, General: Provide ties and anchors, specified in subsequent paragraphs, made from materials that comply with this paragraph, unless otherwise indicated.

1. Galvanized Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating for exterior walls and Class 1 coating for interior walls.
2. Galvanized Steel Sheet: ASTM A 366 cold-rolled, carbon steel sheet hot-dip galvanized after fabrication o comply with ASTM A 153, at exterior walls; and ASTM A 653, G60 (Z180), commercial-quality, steel sheet zinc coated by hot-dip process on continuous lines before fabrication at interior walls.

K. Bent Wire Ties: Rectangular units with closed ends and not less than 4 inches wide, made from 3/16-inch diameter, galvanized steel wire.

L. Adjustable Anchors for Connecting to Steel Frame: Provide two-piece assemblies that allow vertical or horizontal adjustment bur resist tension and compression forces perpendicular to wall.

1. Anchor Section: Crimped ¼ inch diameter, galvanized steel wire anchor section for welding to steel.

2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.1875 inch diameter, galvanized steel wire.

M. Anchors for Connecting to Concrete: Provide two-piece assemblies that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to wall

1. Anchor Section: Dovetail anchor section formed from 0.0528 inch thick, galvanized steel.

2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.1875 inch diameter, galvanized steel wire.

N. Adjustable Masonry-Veneer Anchors: Provide two-piece assemblies that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to wall, for attachment over sheathing to wood or

metal studs, and that are capable of withstanding a 100 lbf load in both tension and compression without deforming of developing play in excess of 0.05 inch

1. Screw-Attached, Masonry-Veneer Anchors: Units consisting of a triangular wire tie and a rib-stiffened, sheet metal anchor section with screw holes top and bottom with raised rib-stiffened strap stamped into center to provide a slot for connection of wire tie.

2. Seismic Masonry-Veneer Anchors: Units consisting of a rib-stiffened, sheet metal anchor section with screw holes top and bottom; with raised rib-stiffened strap stamped into center to provide a slot for a connector section designed to engage a continuous wire embedded in the veneer mortar joint.

O. Masonry Cleaners: As follows:

1. Proprietary Acidic Cleaner: Manufacture's standard strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces.

P. Mortar and Grout Mixes: Do not use admixtures, unless otherwise indicated. Do not use calcium chloride in mortar or grout.

1. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification.

a. Extended-Life Mortar for Unit Masonry: Mortar complying with ASTM C 1142 may be used instead of mortar specified above, at Contractor's option.

b. Limit cementitious materials in mortar to Portland cement, mortar cement, and lime.

c. For masonry below grade, in contact with earth, and where indicated, use Type in accordance with design requirements.

d. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type in accordance with design requirements.

3. Pigmented Mortar: Select and proportion pigments with other ingredients to produce color required. Limit pigments to the following percentages of cement content by weight:

   a. For Portland cement-lime mortar, not more than 10 percent.

   b. For masonry cement or mortar cement not more than 5 percent.

4. Grout for Unit Masonry: Comply with ASTM C 476

   a. Use grout of type (fine or coarse) that will comply with Table 5 of ACI 530.1/ASCE 6/TMS 602 and UBC Table 21-C for dimensions of grout spaces and pour height.

   b. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143.

PART 3 - EXECUTION

3.01 PLACEMENT

A. Cut masonry units with motor-driven saws. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

B. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

C. Wetting of Brick: Wet brick before laying if the initial rate of absorption exceeds 30g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at the time of laying.

D. Comply with tolerances in ACI 530.1/ASCE 6/TMS 602 and the following:

   1. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than ¼ inch in 20 feet, nor ½ inch maximum.

   2. For conspicuous horizontal lines, such as exposed lintels, sills, parapets, and reveals, do not vary from level by more than ¼ inch in 20 feet, nor ½ inch maximum.

E. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size

units, particularly at corners, jambs, and, where possible, at other locations.

F. Bond Pattern for Exposed Masonry: Lay exposed masonry in bond pattern indicated; do not use units with less than normal 4-inch horizontal face dimensions at corners or jambs.

G. Built-in Work: As construction progresses, build in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.

H. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

I. Lay hollow masonry units as follows:

1. With full mortar coverage on horizontal and vertical face shells.

2. Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.

3. For starting course on footings where cells are not grouted, spread out full mortar bed, including areas under cells.

J. Lay solid brick-size masonry units with completely filled bed and head joints, butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

1. At cavity walls, bevel beds away from cavity, to minimize mortar protrusions into cavity.

K. Lay structural-clay tile as follows:

1. Lay vertical-cell units with full head joints, unless otherwise indicated. Provide bed joints with full mortar coverage on face shells and webs.

2. Lay horizontal-cell units with full bed joints, unless otherwise indicated. Form head joints with sufficient mortar so excess will be squeezed out as units are placed in position.

3. Where epoxy-mortar pointed joints are indicated, rake out setting mortar to a uniform depth of ¼ inch and point with epoxy mortar.

L. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than the joint thickness, unless otherwise indicated.

M. Keep cavities clean of mortar droppings and other materials during construction.

1. Use wood strips temporarily placed in cavity to collect mortar droppings. As work progresses, remove strips, clean off mortar droppings, and replace in cavity.

N. Provide continuous masonry joint reinforcement as indicated. Install with a minimum cover of 5/8 inch on exterior side of walls, ½ inch elsewhere. Lap reinforcement a minimum of 6 inches.

1. Provide continuity at corners and wall intersections by using prefabricated “L” and “T” sections.

O. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:

1. Provide an open space not less than 1 inch in width between masonry and structural member, unless otherwise indicated.

2. Anchor masonry to structural members with flexible anchors embedded in masonry joints and attached to structure.

P. Anchor masonry veneers with masonry-veneer anchors to comply with the following requirements:

1. Fasten each anchor section with two metal fasteners of type indicated.

2. Embed fasteners in masonry joints. Provide not less than 2 inches of air space between back of masonry veneer and face of sheathing.

3. Space anchors as indicated, but not more than 16 inches o.c. vertically and 24 inches o.c. horizontally with not less than 1 anchor for each 2.67 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 36 inches, around perimeter.

Q. Provide masonry lintels where shown. Provide precast lintels made from concrete matching concrete masonry units in color, texture, and

compressive strength and with reinforcing bars indicated or required to support loads indicated.

R. Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.

1. Extend flashing 4 inches at ends and turn flashing up not less than 2 inches to form a pan.

2. Install metal drip edges beneath flashing at exterior face of wall. Stop flashing ½ inch back from outside face of wall and adhere flashing to top of metal drip edge.

S. Install weep holes in the head joints in exterior wythes of the first course of masonry immediately above embedded flashing. Install vents in vertical head joints at the top of each continuous cavity at spacing indicated.

1. Use round plastic tubing, rectangular plastic tubing wicking material, or open head joints to form weep holes and vents.

2. Space weep holes 16 inches o.c.

3. Trim wicking material used in weep holes flush with outside face of wall after mortar has set.

T. Temporary Formwork and Shores: Construct formwork and shores to support reinforced masonry elements during construction.

1. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.

U. Placing Reinforcement: Comply with requirements of ACI 530.1/ASCE 6/TMS 602 and Section 2104.5 of the Uniform Building Code.

V. Grouting: Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.

1. Comply with requirements of ACI 530.1/ASCE 6/TMS 602 and Section 2104.6 of the Uniform Building Code for cleanouts and for grout placement, including minimum grout space and maximum pour height.

W. Parge predampened masonry walls, where indicated, with Type S or Type N mortar applied in 2 uniform coats to a total thickness of ¾ inch with a steel-trowel finish. Form a wash at top of parging and a cove at bottom. Damp-cure parging for at least 24 hours.

3.02 CLEANING

A. Cleaning: Clean unit masonry as follows:

1. By dry brushing to remove mortar fins and smears before tooling joints, as work progresses.

2. After mortar is thoroughly set and cured, clean exposed masonry as follows:

a. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.

b. Protect adjacent surfaces from contact with cleaner.

c. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing the surfaces thoroughly with clear water.

d. Clean brick by the bucket-and brush hand-cleaning method described in BIA Technical Notes No. 20, using job-mixed detergent solution.

e. Clean masonry with a proprietary acidic cleaner applied according to manufacturer’s written instructions.

f. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2 applicable to type of stain on exposed surfaces.

g. Consider prefaced only if graffiti is not a problem.

END OF SECTION

General Notes

1. Special inspections are often overlooked for remote construction sites. The owner or the registered design professional is responsible for ensuring that these inspections are conducted in accordance with the International Building Code, Chapter 17.

SECTION 05100
STRUCTURAL STEEL

PART 1 - GENERAL

1.01 WORK INCLUDES

A. Structural Steel, Shapes, Plates, and Bars.

B. Structural Steel Tubing.

C. Steel Pipe

D. Connectors and Fasteners.

E. Welding.

F. Priming.

G. Fabrication.

H. Erection.

1.02 REFERENCE STANDARDS

A. American Institute of Steel Construction (AISC).

B. American Society for Testing and Materials (ASTM).

1. ASTM A 6 – General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Steel Piling.

2. ASTM A 36 – Carbon Structural Steel.

3. ASTM A 53 – Pipe, Steel, Black and Hot-Dipped Zinc-Coated, Welded and Seamless

4. ASTM A 108 – Steel Bars, Carbon, Cold Finished, Standard Quality.

5. ASTM A 307 – Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

6. ASTM A 325 – Structural Bolts, Heat Treated Steel, 120/105 ksi Minimum Tensile Strength.

7. ASTM A 490 – Heat-Treated Steel, Structural Bolts, 150 ksi Minimum Tensile Strength.

8. ASTM A 500 – Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

9. ASTM A 501 – Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

10. ASTM A 572 - High-Strength Low-Allow Colombium – Vanadium Structural Steel.

11. ASTM A 687 – High Strength Nonheaded Steel Bolts and Studs.

12. ASTM A 992 – Structural Steel Shapes

13. ASTM C 150 – Portland Cement.

14. ASTM C 404 – Aggregates for Masonry Grout.

15. ASTM E 94 – Radiographic Testing.

16. ASTM E 142 – Controlling Quality of Radiographic Testing.

17. ASTM E 164 – Practice for Ultrasonic Contact Examination of Weldments.

18. ASTM E 165 – Standard Test Method for Liquid Penetrant Examination.

19. ASTM E 709 – Guide for Magnetic Particle Examination.

20. ASTM F 959 – Compressible Washer – Type Direct Tension Indicators for use with Structural Fasteners.

C. American Welding Society (AWS)

1. AWS D1.1 – Structural Welding Code-Steel).

D. Department of Defense (DOD).

E. Research Council on Structural Connections (RCSC).

F. The Steel Structures Painting Council (SSPC).

1.03 SUBMITTALS

A. Product Data for each type of product specified.

B. Shop Drawings detailing fabrication of structural steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.

2. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.

3. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify high-strength bolted slip-critical, direct-tension, or tensioned shear/bearing connections.

C. Mill test reports signed by manufacturers certifying that their products, including the following comply with requirements.

1.04 QUALITY ASSURANCE

A. Comply with applicable provisions of the following specifications and documents:

1. AISC's - Structural Steel Buildings-Allowable Stress Design and Plastic Design.

2. AISC's - Load and Resistance Factor Design (LFRD) Specification for Structural Steel Buildings.

3. AISC's - Allowable Stress Design of Single-Angle Members.

4. AISC's - Load and Resistance Factor Design of Single-Angle Members.

5. AISC's - Seismic Provisions for Structural Steel Buildings

6. ASTM A 6 - Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.

7. Research Council on Structural Connections (RCSC) "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts.

8. Research Council on Structural Connections (RCSC) "Load and Resistance Factor Design Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

B. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code-Steel."

C. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials for erosion and deterioration.

1. Store fasteners in a protected place. Clean and re-lubricate bolts and nuts that become dry or rusty before use.

2. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Structural Steel Shapes, Plates, and Bars:

1. Carbon Steel: ASTM A 36 .

2. High-Strength, Low-Alloy Columbium-Vanadium Steel: ASTM A 572, Grade 50.

3. Rolled Steel Structural Shapes: ASTM A 992.

B. Cold-Formed Structural Steel Tubing: ASTM A 500, Grade B.

C. Hot-Formed Structural Steel Tubing: ASTM A 501.

D. Steel Pipe: ASTM A 53, Type E or S, Grade B.

1. Weight Class: In accordance with design requirements.

2. Finish: In accordance with design requirements.

E. Shear Connectors: ASTM A 108, Grade 1015 through 1020, headed-stud type, cold-finished carbon steel, AWS D1.1, Type B.

F. Anchor Rods, Bolts, Nuts, and Washers: as follows:

1. Nonheaded Rods: ASTM A 36.

2. Nonheaded Rods: ASTM A 572, Grade 50.

3. Nonheaded Bolts: ASTM A 687, high strength.

4. Headed Bolts: ASTM A 307, Grade A; carbon-steel, hex-head bolts; and carbon-steel nuts.

5. Headed Bolts: ASTM A 325, Type 1, heavy hex steel structural bolts and heavy hex carbon-steel nuts.

6. Headed Bolts: ASTM A 490, Type 1, heavy hex steel structural bolts and heavy hex carbon-steel nuts.

7. Washers: ASTM A36.

G. Nonhigh-Strength Bolts, Nuts, and Washers: ASTM A 307, Grade A

1. Finish: Plain, in accordance with design requirements.

H. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers.

1. Finish: In accordance with design requirements.

2. Direct-Tension Indicators: ASTM F 959, Type 325.

a. Finish: Plain, in accordance with design requirements.

I. High-Strength Bolts, Nuts, and Washers: ASTM A 49, Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers, uncoated.

1. Direct-Tension Indicators: ASTM F 959, Type 490, uncoated.

J. Welding Electrodes: Comply with AWS requirements.

2.02 PRIMER (Select in accordance with design requirements)

A. Primer: SSPC-Paint 25; red iron oxide, raw linseed oil and alkyd primer.

B. Primer: SSPC-Paint 23, latex primer.

C. Primer: SSPC-Paint 15, Type I, red oxide.

D. Primer: Fabricator's standard lead-and chromate-free, non-asphaltic, rust-inhibiting primer.

E. Primer: Non-asphaltic primer complying with SSPC's "Painting System Guide No. 7.00."

F. Galvanized Repair Paint: High-zinc-dust-content paint for re-galvanizing welds and repair painting galvanized steel, with dry film containing not less than 93 percent zinc dust by weight, and complying with DOD-P-21035A or SSPC-Paint 20.

2.03 Grout

A. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404, size No. 2. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

2.04 FABRICATION

A. Fabricate and assemble structural steel in shop to greatest extent possible. Fabricate structural steel according to AISC specifications referenced in this Section and in Shop Drawings.

1. Camber structural steel members where indicated.

2. Identify high-strength structural steel according to ASTM A 6 and maintain markings until steel has been erected.

3. Mark and match-mark materials for field assembly.

4. Fabricate for delivery a sequence that will expedite erection and minimize field handling of structural steel.

B. Thermal cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded.

C. Finishing: Accurately mill ends of columns and other members transmitting loads in bearing.

D. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of head-stud shear connectors according to AWS D1.1 and manufacturer's printed instructions.

E. Steel Wall Framing: Select true and straight members for fabricating steel wall framing to be attached to structural steel framing. Straighten as required to provide uniform, square, and true members in complete wall framing.

F. Holes: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, as shown on Shop Drawings.

1. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning. Drill holes in bearing plates.

2. Weld threaded nuts to framing and other specialty items as indicated to receive other work.

2.05 SHOP CONNECTIONS

A. Shop install and tighten non-high-strength bolts, except where high-strength bolts are indicated.

B. Shop install and tighten high-strength bolts according to RCSC's "Specification for Structural Joints using ASTM A 325 or A 490 Bolts."

1. Bolts: ASTM A 325 high-strength bolts, unless otherwise indicated.

D. Weld connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.

2.06 SHOP PRIMING

A. Shop prime steel surfaces, except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.

2. Surfaces to be field welded.

3. Surfaces to be high-strength bolted with slip-critical connections.

4. Surfaces to receive sprayed-on fireproofing.

5. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust, loose mill scale, and spatter, slag, or flux deposits. Prepare surfaces according to SSPC specifications as follows:

1. SSPC: in accordance with design requirements.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Before erection proceeds, and with the steel erector present, verify elevations of concrete and masonry bearing surfaces and locations of anchorages for compliance with requirements.

B. Do not proceed with erection until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.

3.03 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC specifications referenced in this Section.

B. Base and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.

1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.

2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.

3. Pack grout solidly between bearing surfaces and plates so no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.

a. Comply with manufacturer's instructions for proprietary grout materials.

C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces, and other surfaces, that will be in permanent contact. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.

2. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when complete and in service.

E. Splice members only where indicated.

F. Finish sections thermally cut during erection equal to a sheared appearance.

F. Do not enlarge unfair holes in members by burning or by using drift pins. Ream holes that must be enlarged to admit bolts.

3.04 FIELD CONNECTIONS

A. Install and tighten non-high-strength bolts, except where high-strength bolts are indicated.

B. Install and tighten high-strength bolts according to RCSC's "Specification for Structural Joints using ASTM A 325 or A 490 Bolts."

C. Install and tighten high-strength bolts according to RCSC's "Load and Resistance Factor Design Specification for Structural Joints using ASTM A325 or A 490 Bolts."

1. Bolts: ASTM A 325 high-strength bolts, unless otherwise indicated.

2. Connection Type: Snug tighten, unless indicated as slip-critical, direct-tension, or tensioned shear/bearing connections.

3. Connection Type: Slip-criteria, direct tension, or tensioned shear/bearing connections as indicated.

D. Weld Connections: Comply with AWS D1.1 for procedures and quality of welds, and methods used in correcting welding work.

1. Comply with AISC specifications referenced in this Section for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

3.05 FIELD QUALITY CONTROL

A. Owner will engage an independent testing and inspecting agency to perform field inspections and tests and to prepare test reports.

1. Testing agency will conduct and interpret tests and state in each report whether tested work complies with or deviates from requirements.

B. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.

C. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirement.

D. Field-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints using ASTM A 325.

1. Direct tension indicator gaps will be verified o comply with ASTM F 959, Table 2.

E. In addition to visual inspection, field-welded connections will be inspected and tested according to AWS D1.1 and the inspection procedures listed below)As required by Design Requirements).

1. Liquid Penetrant Inspection: ASTM E 165.

2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.

3. Radiograpic Inspection: ASTM E 94 and ASTM E 142; minimum quality level "2-2T."

4. Ultrasonic Inspection: ASTM E 164.

F. In addition to visual inspection, field-welded shear connectors shall be inspected and tested according to requirements of AWS D1.1 for stud welding and as follows:

1. Bend tests shall be performed when visual inspection reveal either less than a continuous 360-degree flash or welding repairs to any shear connector.

2. Test shall be conducted on additional shear connectors when weld fracture occurs on shear connectors already tested, according to requirements of AWS D1.1.

3.06 CLEANING

A. Touchup painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting.

1. Apply by brush or spray to provide a minimum dry film thickness of 1.5 mils.

END OF SECTION

General Notes:

1. Priming steel that is scheduled to receive sprayed-on fire proofing is not recommended. If conditions dictate the necessity for priming steel coordinate compatibility with fire-proofing manufacturer.

2. Special inspections are often overlooked for remote construction sites. The owner or the registered design professional is responsible for ensuring that these inspections are conducted in accordance with the International Building Code, Chapter 17.

3. Coordinate requirements for low temperature steel for facilities with steel exposed to extreme low temperatures.

SECTION 05210
STEEL JOISTS

PART 1 - GENERAL

1.01 WORK INCLUDES

A. Open Web Steel Joists

B. Long Span Steel Joists

C. Accessories and Fittings

1.02 REFERENCE STANDARDS

A. Steel Joist Institute (SJI)

1. SJI Specs & Tables – Standard Specifications and Load Tables for Steel Joists and Joist Girders.

1.03 SUBMITTALS

A. Shop Drawings:

1. Detail drawings shall include fabrication and erection details, specifications for shop painting, and identification markings of joists and joist girders.

2. Shop Drawings shall be prepared under the supervision and certified by an engineer licensed in the State of Alaska.

B. Certificates:

1. Certificates stating that the steel joists and joist girders have been designed and manufactured in accordance with SJI Specification and Tables. Complete engineering design computations may be submitted in lieu of the certification.

1.04 DELIVERY AND STORAGE

A. Materials shall be delivered to the site in undamaged condition and stored off the ground in a well drained location, protected from damage, and easily accessible for inspection and handling.

PART 2 - PRODUCTS

2.01 OPEN WEB STEEL JOISTS

A. Open web steel joists shall conform to SJI Specification and Tables, K-Series. Joists shall be designed to support the loads given in the standard load tables of SJI Specification and Tables.

2.02 LONGSPAN STEEL JOISTS

A. Longspan steel joists and deep longspan steel joists shall conform to SJI Specification and Tables, LH Series. Joists designated LH and DLH shall be designed to support the loads given in the applicable standard load table of SJI Specification and Tables.

PART 3 - EXECUTION

3.01 ERECTION

A. Installation of joists shall be in accordance with the standard specification under which the member was produced. Joists and joist girders shall be handled in a manner to avoid damage. Damaged joists and joist girders shall be removed from the site, except when field repair is approved and such repairs are satisfactorily made in accordance with the manufacturer's recommendations. Joists shall be accurately set, and end anchorage shall be in accordance with the standard specification under which the joists and joist girders were produced. For spans over 40 ft through 60 ft one row of bridging nearest midspan shall be bolted diagonal bridging; for spans over 60 ft bolted diagonal bridging shall be used instead of welded horizontal bridging. Joist bridging and anchoring shall be secured in place prior to the application of any construction loads. Any temporary loads shall be distributed so that the carrying capacity of any joist is not exceeded. Loads shall not be applied to bridging during construction or in the complete work. Abraded, corroded, and field welded areas shall be cleaned and touched up with the same type of paint used in the shop painting.

3.02 BEARING PLATES

A. Bearing plates shall be provided with full bearing after the supporting members have been plumbed and properly positioned, but prior to placing superimposed

loads. The area under the plate shall be damp-packed solidly with bedding mortar, except where non-shrink grout is indicated on the drawings.

END OF SECTION

General Notes

1. *Primary paint on steel joist does not provide significant corrosion protection but may be adequate for shipping, storage, and short term exposure to weather.*

2. *If finish painting is required coordinate compatibility of primer with painting manufacturer.*

3. *Steel joist scheduled to receive fire proofing require coordination of painting system and fire proofing for compatibility.*

4. *Do not allow attachments to steel joists by welding, bolting, or otherwise that have not been considered in the design of the joists.*

5. *Special inspections are often overlooked for remote construction sites. The owner or the registered design professional is responsible for ensuring that these inspections are conducted in accordance with the International Building Code, Chapter 17.*

SECTION 05310
STEEL DECKS

PART 1 - GENERAL

1.01 WORK INCLUDES

A. Steel Decks (Cellular and Non-Cellular).

B. Steel Decks (Composite).

C. Steel Decks (Cellular).

1.02 REFERENCE STANDARDS

A. American Institute of Steel Construction (AISC).

1. AISC 335 – Structural Steel Buildings, Allowable Stress Design and Plastic Design.

B. American Iron and Steel Institute (AISI)

1. AISI SG 973 – Cold Formed Steel Design Manual.

C. American Welding Society (AWS)

1. AWS D 1.1 – Structural Welding Code – Steel.

2. AWS D 1.3 – Structural Welding Code – Sheet Steel.

3. AWS.S 1.1

D. American Society for Testing and Materials (ASTM).

1. ASTM A 108 – Steel Bars, Carbon, Cold Finished, Standard Quality.

2. ASTM A 570 – Steel, Sheet and Strip, Carbon, Hot-Rolled.

3. ASTM A 653 – Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

4. ASTM A 780 – Repair of Damaged and Uncoated Areas of Hot-Dipped Galvanized Coatings.

5. ASTM A 792 – Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by he Hot-Dip Process.

6. ASTM A 1008 – Steel Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High Strength Low-Alloy with Improved Formability.

7. ASTM C 423 – Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

E. FM Global (FM)

1. FM DS 1 28 – Design Wind Loads.

2. FM P 7825 – Approval Guide.

F. National Fire Protection Association (NFPA)

1. NFPA 70 – National Electrical Code

G. Steel Deck Institute (SDI)

1. SDI 30 – Design Manual for Composite Decks, Form Decks, and Roof Decks.

2. SDI DDMO 2 – Diaqphragm Design Manual

3. SDI DDP – R 2,000 Deck Damage and Penetrations.

4. SDI MOC I – Manual of Construction with Steel Deck.

H. The Steel Structures Painting Coatings (SSPC)

1. SSPC Paint 20 0 Zinc-Rich Primers, (Type I - “Inorganic” and Type II - “Organic”).

I. U.S. Department of Defense (DOD)

1. UFC 3 310 01 – Load Assumptions for Buildings.

J. Underwriters Laboratories (UL)

1. UL 209 – Cellular Metal Floor Raceways and Fittings.

2. UL 580 – Tests for uplift Resistance of Roof Assemblies.

3. UL Bld Mat Dir – Building Materials Directory.

1.03 SUBMITTALS

A. Shop Drawings

1. Show layout, spacings, sizes, thicknesses, and types of cold formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, open framing, supplemental framing, strapping, bracing, bridges, splices, accessories, connection details, and attachment to adjoining work.

B. Product Data

1. Provide product data for each type of cold-formed metal framing, product and accessory.

C. Design Data

1. Submit manufacturer's design calculations, or applicable published literature for the structural properties of the proposed deck units.

D. Certificates

1. Provide mill certificates indicating that steel sheet complies with design requirements.

1.04 QUALITY ASSURANCE

A. Deck Units

1. Deck units and accessories shall be products of a manufacturer regularly engaged in manufacture of steel decking. Provide manufacturer's certificates attesting that the decking material meets the specified requirements.

B. Qualification of Welders

1. Provide welder qualification procedures, welder qualifications, and duration of qualification period in accordance with AWS D 1.1 and AWS D 1.3.

C. Regulatory Requirements

1. Roof deck shall have been tested as a part of a roof deck construction assembly of the type used for this project, shall be listed as fire classified in he UL Bld Mat Dir, or listed as Class I construction in the FM P 7825, and so labeled.

2. The roof construction assembly shall be capable of withstanding an uplift pressure when tested in accordance with the uplift pressure test described in the FM DS 1-28 or as described in UL 580 and in general compliance with UFC 3-310-01.

D. Fabrication Drawings

1. Show type and location of units, location and sequence of connections, bearing on supports, methods of anchoring, attachment of accessories, adjusting plate details, size and location of holes to be cut and reinforcement to be provided, the manufacturer's erection instructions and other pertinent details.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver deck units to the site in a dry and undamaged condition. Store and handle steel deck in a manner to protect it from corrosion, deformation, and other types of damage. Do not use decking for storage or as working platform until units have been fastened into position. Exercise care not to damage material or overload decking during construction. The maximum uniform distributed storage load shall not exceed the design live load. Stack decking on platforms or pallets and cover with weathertight ventilated covering. Elevate one end during storage to provide drainage. Maintain deck finish at all times to prevent formation of rust. Repair deck finish using touch-up paint. Replace damaged material.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Steel Sheet

1. Flat rolled carbon steel sheets of structural quality, thickness in accordance with design requirement meeting the requirements of AISI SG 973, except as modified herein. For acoustical steel deck units, provide

perforated sheets with 5/32 inch diameter holes staggered 3/8 inch on-centers.

B. Steel Coating

1. ASTM A 653 designation Z275, G90 galvanized, or ASTM A 792 designation AZ 165 or AZ 55, aluminum-zinc alloy. Apply coating to both sides of sheet. Coating for decking provided as wire raceways shall conform to UL 209.

C. Sound Absorbing Material

1. Provide glass fiber or pre-molded form for acoustical non-cellular steel roof deck and glass fiber rigid strip for acoustical cellular steel deck in accordance with the manufacturer's standards.

2.02 ACCESSORIES

A. General

1. Provide accessories of same material as deck, unless specified otherwise. Provide manufacturer's standard type accessories, as specified.

B. Adjusting Plates

1. Provide adjusting plates, or segments of deck units, of same thickness and configuration as deck units in locations too narrow to accommodate full size units. Provide factory cut plates of predetermined size where possible.

C. End Closures

1. Fabricated of sheet metal by the deck manufacturer. Provide end closures minimum 0.028 inch thick to close open ends at exposed edges of floors, parapets, end walls, eaves, and openings through deck.

D. Partition Closers

1. Provide closures for closing voids above interior walls and partitions that are perpendicular to the direction of the configurations. Provide rubber, plastic, or sheet steel closures above typical partitions. Provide minimum one inch thick soft composition rubber closures above walls and partitions contiguous to acoustical steel deck. Provide sheet steel closures above fire-resistant interior walls and partitions located on both sides of wall or

partition. Provide glass fiber blanket insulation in the space between pairs of closures at acoustical partitions.

E. Closure Plates for Composite Deck

1. The concrete shall be supported and retained at each floor level. Provide edge closures at all edges of the slab of sufficient strength and stiffness to support the wet concrete. Metal closures shall be provided for all openings in composite steel deck ¼ inch and over.

F. Sheet Metal Collar

1. Where deck is cut for passage of pipes, ducts, columns, etc., and deck is to remain exposed, provide a neatly cut sheet metal collar to cover edges of deck. Do not cut deck until after installation of supplemental supports.

G. Cover Plates

1. Sheet metal to close panel edge and end conditions, and where panels change direction or butt. Polyethylene-coated, self-adhesive, 2 inch wide joint tape may be provided in lieu of cover plates on flat-surfaced decking butt joints.

H. Sump Pans

1. Sump pans shall be provided for roof drains and shall be minimum 0.075 inch thick steel, flat or recessed type. Sump pans shall be shaped to meet roof slope by the supplier or by a sheet metal specialist. Bearing flanges of sump pans shall overlap steel deck a minimum 3 inches. Opening in bottom of pan shall be shaped, sized, and reinforced to receive roof drain.

I. Column Closures

1. Sheet metal, minimum 0.0358 inch thick or metal rib lath.

J. Access Hole Covers

1. Sheet Metal, minimum 0.0474 inch thick.

K. Hanger

1. Provide clips or loops for utility systems and suspended ceilings of one or more of the following types:

a. Lip tabs or integral tabs where non-cellular decking or flat plate of cellular section is 0.0474 inch thick or more, and a structural concrete fill is used over deck.

b. Slots or holes punched in decking for installation of pigtails.

c. Tabs driven from top side of decking and arranged so as not to pierce electrical cells.

L. Shear Connectors

1. Shear connectors shall be headed stud type, ASTM A 108m Grade 1015 or 1020, cold finished carbon steel with dimensions complying with AISC 335 and or strap type, ASTM A 570, Grade D, hot-rolled carbon steel.

a. Provide mechanical fasteners, such as powder actuated or pneumatically driven fasteners, for anchoring the deck to structural supports and adjoining units that are designed to meet the loads indicated. Provide positive locking-type fasteners standard with the Steel Deck Institute and the steel deck manufacturer.

b. Miscellaneous Accessories: The manufacturer's standard accessories shall be furnished as necessary to complete the deck installation. Metal accessories shall be of the same material as the deck and have minimum design thickness as follows: saddles, 0.0474 inch; welding washers 0.0598 inches; cant strip, 0.0295 inch; other metal accessories, 0.0358 inch; unless otherwise indicated. Accessories shall include but not be limited to saddles, welding washers, fasteners, cant strips, butt cover plates, underlapping sleeves, and ridge and valley plates.

2.03 FABRICATION

A. Deck Units

1. Deck units shall conform to SDI 30. Form cellular and non-cellular decking and accessories shall conform to ASTM A 653, SQ, Grade 230, Grade 44; ASTM A 1008 Coated Carbon Steel Sheets, Grade C, 33,000 psi minimum yield strength; or ASTM A 792 Coated Steel Sheets, Grade 33. Panels of maximum possible lengths shall be used to minimize end laps. Deck units shall be fabricated in lengths to span 3 or more supports with flush, telescoped, or nested 2 inch laps at ends, and interlocking, or nested side laps, unless otherwise indicated. Deck with cross-sectional

configuration differing from the units indicated may be used, provided that the properties of the proposed units, determined in accordance with AISI SG 973, are equal to or greater than the properties of the units indicated and that the material will fit the space provided without requiring revisions to adjacent materials or systems.

B. Roof Deck

1. Deck used in conjunction with insulation and built-up roofing shall conform to ASTM A 792 or ASTM A 1008. Roof deck units shall be fabricated of thickness required by the design requirements and shall be shop painted galvanized, or painted with an epoxy coating, or equivalent applied to prime-coating in accordance with manufacturer's standard or zinc-coated in conformance with ASTM A 653, G 90 coating class or aluminum-zinc coated in accordance with ASTM A 792 Coating Designation AZ 55.

C. Composite Deck

1. Composite deck assembly shall conform to ASTM A 653 or ASTM A 1008. Deck used as the tension reinforcing in composite deck shall be fabricated of thickness required by the design requirements. Zinc-coated in conformance with ASTM A 653, G 6 or G 90 coating class.

2. In addition to resisting shear, devices shall provide resistance to vertical separation between the steel deck and the concrete. Provide one of the following types of shear devices:

a. Mechanically fixed shear devices such as embossments, holes, or welded buttons.

b. Mechanically fixed shear devices such as inverted, triangular-shaped ribs.

D. Cellular Decking

1. Cellular decking provided as wire raceways, shall conform to NFPA 70.

E. Acoustical Steel Deck

1. Provide a Noise Reduction Coefficient (NRC) rating in accordance with design requirements when tested in accordance with ASTM C 423, Standard Mounting No. 6. Sound absorbing materials shall be either glass

fiber in roll or pre-molded form for acoustical steel deck non-cellular or glass fiber rigid strip for acoustical steel deck cellular in accordance with manufacturer's standards.

F. Venting

1. To ensure positive venting from the underside, provide slotted or perforated steel deck to receive concrete fill, overlay, or a poured concrete deck.

G. Shop Priming

1. Shop prime accessories and underside of deck at the factory after coating. Clean surfaces in accordance with the manufacturer's standard procedure followed by a spray, dip or roller coat of rust-inhibitive primer, oven cured. Provide shop primer compatible with field applied sprayed-on fireproofing and field applied finish painting, if required.

H. Touch-up Paint

1. Touch-up paint for shop-painted units shall be of the same type used for the shop painting, and touch-up paint for zinc-coated units shall be an approved galvanizing repair paint with a high-zinc dust content. Welds shall be touched-up with paint conforming to SSPC Paint 20 in accordance with ASTM A 780. Finish of deck units and accessories shall be maintained by using touch-up paint whenever necessary to prevent the formation of rust.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of decking units and accessories, examine worksite to verify that as-built structure will permit installation of decking system without modification.

3.02 INSTALLATION

A. General

1. Install steel deck units in accordance with SDI 30 or SDI DDMO 2 and approved shop drawings. Place units on structural supports, properly adjusted, leveled, and aligned at right angles to supports before

permanently securing in place. Damaged deck and accessories including material which is permanently stained or contaminated, deformed, or with burned holes shall not be installed. Extend deck units over three or more supports unless absolutely impractical. Locate deck ends over supports only. Do not use unanchored deck units as a work or storage platform. Do not fill unanchored deck with concrete. Permanently anchor units placed by the end of each working day. Do not support suspended ceilings, light fixtures, ducts, utilities, or other loads by steel deck unless indicated. Loads shall be distributed by appropriate means to prevent damage. Size cellular decking provided as electrical raceways to accommodate indicated wiring systems. Chip off burrs and eliminate sharp edges which may damage wiring. Mesh decking panels accurately and place in accordance with UL 209. Acoustical material shall be neatly fitted into the rib voids.

B. Attachment

1. Immediately after placement and alignment, and after correcting inaccuracies, permanently fasten steel deck units to structural supports and to adjacent deck units by welding with normal 5/8 inch diameter puddle welds fastened with screws, powder-actuated fasteners, or pneumatically driven fasteners in accordance with design requirements and manufacturer's recommended procedure and SDI 30. Clamp or weight deck units to provide firm contact between deck units and structural supports with powder-actuated fasteners or pneumatically driven fasteners is prohibited. Attachment of adjacent deck units by button-punching is prohibited.

   a. Welding: Perform welding in accordance with AWS D 1.3 using methods end electrodes recommended by the manufacturers of the base metal alloys being used. Ensure only operators previously qualified by tests prescribed in AWS D 1.1 and AWS D 1.3 make welds. Immediately recertify, or replace with qualified welders, welders that have passed qualification tests but are producing unsatisfactory welding. Location, size, and spacing of fastening shall be in accordance with design requirements and conform to the recommendations of the Steel Deck Institute and the Steel Deck Manufacturer. Welding washers shall be used at the connections of the deck to supports. Welding washers shall not be used at sidelaps.

Holes and similar defects will not be acceptable. Deck ends shall be lapped 2 inches. All partial or segments of deck units shall be attached to structural supports. Shear connectors shall be attached as shown and shall be welded as per AWS S 1.1 through the steel deck to the steel member of directly to the steel member. Immediately clean welds by chipping and wire brushing. Heavily coat welds, cut edges and damaged portions of coated finish with zinc-dust paint conforming to ASTM A 780 shop primed and painted finish with the manufacturer's standard touch-up paint.

b. Fastening: Anchor deck to structural supports and adjoining units with mechanical deck fasteners as recommended by the Steel Deck Institute and the steel deck manufacturer. Powder-actuated fasteners shall be driven with a low-velocity piston tool by an operator authorized by the manufacturer of the piston tool. Pneumatically driven fasteners shall be driven with a low-velocity fastening tool and shall comply with the manufacturer's recommendations.

C. Openings

1. All holes and openings required shall be cut or drilled holes and be coordinated with the drawings, specifications, and other trades. Frame and reinforce openings through the deck in conformance with SDI DDP. Holes and openings 6 to 12 inches across shall be reinforced by steel channels or angles installed perpendicular to the steel joists and supported by the adjacent steel joists. Steel channels or angles shall be installed perpendicular to the deck ribs and shall be fastened to the channels or angles perpendicular to the steel joists. Deck manufacturer shall approve holes or openings larger than 6 inches in diameter prior to drilling or cutting. Openings shall not interfere with seismic members such as chords and drag struts.

D. Deck Requirements

1. SDI MOCI, for repair of deck damage.

2. End Closures: Provide end closure to close open ends of cells at columns, walls, and openings in deck.

3. Closure Above Partition: Provide for closing voids between cells over partitions that are perpendicular to direction of cells. Provide a one-piece closure strip for partitions 4 inches nominal or less in thickness and two-piece closure strips for wider partitions. Provide sheet metal closures above fire-rated partitions at both sides of partition with space between filled with fiberglass insulation. Provide flexible rubber closures above filled with blanket insulation.

4. Cover Plates: Provide metal cover plates, or joint tape, at joints between cellular decking sheets to be used as electrical raceways. Where concrete leakage would be a problem, provide metal cover plates, or joint tape, at joints between decking sheets, cellular or non-cellular, to be covered with concrete fill.

5. Column Closures: Provide for spaces between floor decking and columns which penetrate the deck. Field cut closure plate to fit column in the field and tack weld to decking and columns.

6. Access Hole Covers: Provide to seal holes cut in decking to facilitate welding of decking to structural supports.

7. Hangers: Provide as indicated to support utility system and suspended ceilings. Space devices in accordance with design requirements.

F. Sound Absorbing Material

1. Install sound absorbing glass fiber roll or pre-molded form, neatly in voids between perforated webs of acoustical non-cellular steel deck and glass fiber rigid strip, in cells of acoustical cellular steel deck. Keep sound absorbing material dry before, during and after installation.

G. Concrete Work

1. Prior to placement of concrete, inspect installed decking to ensure that there has been no permanent deflection or other damage to decking. Replace decking which has been damaged or permanently deflected as approved. Place concrete on metal deck in accordance with Construction Practice of SDI 30.

H. Preparation of Fire-Proofed Surfaces

1. Deck surfaces, both composite and non-composite, which are to receive sprayed-on fireproofing, shall be galvanized and shall be free of all grease, mill oil, paraffin, dirt, salt, and other contaminants which impair adhesion of the fireproofing. Any required cleaning shall be done prior to steel deck installation using a cleaning method that is compatible with the sprayed-on fireproofing.

3.03 FIELD QUALITY CONTROL

1. Inspect the decking top surface for distortion after installation. For roof decks not receiving concrete, verify distortion by placing a straight edge across three adjacent top flanges. The maximum allowable gap between the straight edge and the top flanges is 1/16 inch; when gap is more than 1/16 inch, provide corrective measures or replacement. Re-inspect decking after performing corrective measures or replacement.

END OF SECTION

General Notes

1. Special inspections are often overlooked for remote construction sites. The owner or the registered design professional is responsible for ensuring that these inspections are conducted in accordance with the International Building Code, Chapter 17.

SECTION 05400
COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.01 WORK INCLUDES

A. Exterior Load-Bearing Wall Framing.

B. Interior Load-Bearing Wall Framing.

C. Exterior Non-Load-Bearing Curtain-Wall Framing.

D. Floor Joist Framing.

E. Roof Rafter

F. Ceiling Joist Framing

1.02 REFERENCE STANDARD

A. American Society for Testing and Materials

1. ASTM A 36 – Specific Carbon Structural Steel.

2. ASTM A 123 – Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

3. ASTM A 653 – Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

4. ASTM C 955 – Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Applicati9on of Gypsum Panel Products and Metal plaster Bases.

5. ASTM C 1007 – Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories.

6. ASTM E 119 – Test Methods for Fire Tests of Building Construction and Materials.

7. ASTM E 329 – Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.

8. ASTM E 488 – Test Methods for Strength of Anchors in Concrete and Masonry Elements.

9. ASTM E 548 – Guide for General Criteria Used for Evaluating Laboratory Competence.

10. ASTM E 1190 – Test Methods for Strength of Power-Actuated Fasteners Installed in Structural Members.

B. Gypsum Association (GA)

1. Fire Resistance Design Manual

1.03 SUBMITTALS

A. Product Data: For each type of cold-formed metal framing product and accessory indicated.

B. Mill Certificates signed by steel sheet producer or test reports from a qualified independent testing agency, indicating steel sheet complies with requirements.

C. Product Test Reports: From a qualified testing agency indicating that each of the following complies with requirements, based on comprehensive testing of current products:

1. Expansion anchors.
2. Power-actuated anchors.
3. Mechanical fasteners.
4. Vertical deflection clips.
5. Miscellaneous structural clips and accessories.

D. Research/Evaluation Reports: Evidence of cold-formed metal framing's compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed cold-formed metal framing similar in material, design, and extent to that

indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Mill certificates signed by steel producer or test reports from a qualified independent testing agency indicating steel sheet complies with requirements, including uncoated steel thickness, yield strength, tensile strength, total elongation, chemical requirements, ductility, and galvanized-coating thickness.

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

D. Fire-Test-Response Characteristics: Where metal framing is part of a fire-resistance-rated assembly, provide framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance Ratings: Indicated by GA File Numbers in GA-600, "Fire Resistance Design Manual," or by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Steel Sheet: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: In accordance with structural requirements.

2. Coating: G60

2.02 LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, complying with ASTM C955, and as follows:

1. Minimum Uncoated-Steel Thickness: In accordance with structural requirements.

2. Flange Width: In accordance with structural requirements.

3. Section Properties: In accordance with structural requirements.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, un-punched, with straight flanges, complying with ASTM C955, and as follows:

1. Minimum Uncoated-Steel Thickness: In accordance with structural requirements.

2. Flange Width: In accordance with structural requirements.

2.03 NON-LOAD-BEARING CURTAIN-WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, complying with ASTM C955, and as follows:

1. Minimum Uncoated-Steel Thickness: In accordance with structural requirements.

2. Flange Width: In accordance with structural requirements.

3. Section Properties: In accordance with structural requirements.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, complying with ASTM C955, and as follows:

1. Minimum Uncoated-Steel Thickness: In accordance with structural requirements.

2. Flange Width: In accordance with structural requirements.

C. Single-Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track, unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads, and as follows:

1. Minimum Uncoated-Steel Thickness: In accordance with structural requirements.

2. Flange Width: In accordance with structural requirements.

D. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.

1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal and lateral loads, and as follows:

a. Minimum Uncoated-Steel Thickness: In accordance with structural requirements.

b. Flange Width: In accordance with structural requirements.

E. Vertical Deflection Clips: Manufacturer's standard head clips, capable of accommodating upward and downward vertical displacement of primary structure.

2.04 FLOOR JOIST FRAMING

A. Steel Joists: Manufacturer's standard C-shaped steel joists, of web depth indicated, with stiffened flanges, complying with ASTM C 955, and as follows:

1. Minimum Uncoated-Steel Thickness: In accordance with structural requirements.

2. Flange Width: In accordance with structural requirements.

3. Section Properties: In accordance with structural requirements.

B. Steel Joist Track: Manufacturer's standard U-shaped steel joist track, of web depths indicated, unpunched, with unstiffend flanges, complying with ASTM C 955, and as follows:

1. Minimum Uncoated-Steel Thickness: In accordance with structural requirements.

2. Flange Width: In accordance with structural requirements.

2.05 ROOF-RAFTER FRAMING

A. Steel Rafters: Manufacturer's standard C-shaped steel sections, of web depths indicated, unpunched, with stiffened flanges, complying with ASTM C 955, and as follows:

1. Minimum Uncoated-Steel Thickness: In accordance with structural requirements.

2. Flange Width: In accordance with structural requirements.

3. Section Properties: In accordance with structural requirements.

B. Built-up Members: Built-up members of manufacturer's standard C-shaped steel section, with stiffened flanges, nested into a U-shaped steel section joist track, with unstiffened flanges; unpunched; of web depths indicated; complying with ASTM C 955, and as follows:

1. Minimum Uncoated-Steel Thickness: In accordance with structural requirements.

2. Flange Width: In accordance with structural requirements.

2.06 CEILING JOIST FRAMING

A. Steel Ceiling Joists: Manufacturer's standard steel sections, of web depths indicated, unpunched, with stiffened flanges, complying with ASTM C 955, and as follows:

1. Minimum Uncoated-Steel Thickness: In accordance with structural requirements.

2. Flange Width: In accordance with structural requirements.

3. Section Properties: In accordance with structural requirements.

2.07 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories of the same material and finish; used for framing members, with a minimum yield strength of 33,000 psi.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.

3. Web stiffeners.
4. End clips.
5. Foundation clips.
6. Gusset plates.
7. Stud kickers, knee braces, and girts.
8. Joist hangers and end closures.
9. Hole reinforcing plates.
10. Backer plates.

2.08 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123.

B. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

C. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent resting agency.

D. Mechanical Fasteners: Corrosion-resistant-coated, self-drilling, self-threading steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

2.09 FABRICATION

A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with; connections securely fastened, according to manufacturer's written recommendations and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.

2. Cut framing members by sawing or shearing; do not torch cut.

3. Fasten cold-formed metal framing members, screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.

a. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.

4. Fasten other materials to cold-formed metal framing by bolting, or screw fastening.

B. Reinforce, stiffen and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum our-or-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed metal framing according to ASTM C 1007, unless more stringent requirements are indicated.

C. Install shop-or field fabricated, cold-formed framing and securely anchor to supporting structure.

1. Bolt or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to manufacturer's written recommendations and requirements in this Section.

1. Cut framing members by sawing or shearing; do not torch cut.

2. Fasten cold-formed metal framing members by screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.

E. Install framing members in one-piece lengths, unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

H. Erection Tolerances: Install cold-formed framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch (1:960) and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.02 LOAD-BEARING WALL INSTALLATION

A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:

1. Anchor Spacing: In accordance with structural requirements

B. Squarely seat studs against webs of top and bottom tracks. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:

1. Stud Spacing: In accordance with structural requirements

C. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar configurations.

D. Align studs vertically where wall-framing continuity is interrupted by floor framing. Where studs cannot be aligned, continuously reinforce track to transfer loads.

E. Align floor and roof framing over studs. Where framing cannot be aligned, continuously reinforce track to transfer loads.

F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.

G. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.

1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings.

2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or be welding, and space jack studs same as full-height wall studs.

H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.

1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.

I. Install horizontal bridging in stud system, spaced in accordance with structural requirements. Fasten at each stud intersection

1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of two screws into each flange of the clip angle.

2. Bridging: Combination of flat, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and

thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.

J. Install steel sheet diagonal bracing straps to both stud flanges, terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.

K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.03 NON-LOAD-BEARING CURTAIN-WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Space studs as follows:

1. Stud Spacing: In accordance with structural requirements.

C. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

E. Install horizontal bridging in curtain-wall studs, but not more than 54 inches apart. Fasten at each stud intersection.

1. Install solid blocking in accordance with structural requirements.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable curtain-wall-framing system.

3.04 JOIST INSTALLATION

A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated.

B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.

1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches.

2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections in accordance with structural requirements.

C. Space joists not more than 2 inches from abutting walls, and as follows:

1. Joist Spacing: In accordance with structural requirements.

D. Frame openings with built-up joist headers consisting of joist and joist track, nesting joists, or another combination of connected joist if indicated.

E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement.

1. Install web stiffeners to transfer axial loads of walls above.

F. Install bridging at each end of joists and at intervals indicated the Drawings. Fasten bridging at each joist intersection as follows:

1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to bottom flange of joists.

2. Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.

3. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.

G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.

H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down

angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

END OF SECTION

General Notes

1. *Special inspections are often overlooked for remote construction sites. The owner or the registered design professional is responsible for ensuring that these inspections are conducted in accordance with the International Building Code, Chapter 17.*

SECTION 05500

METAL FABRICATION

PART 1 - GENERAL

1.01 WORK INCLUDES

A. Stairs

B. Cover-Plates and Frames

C. Floor Grating and Access Walkways

D. Handrails

E. Ladders and Ship's Ladders

1.02 REFERENCE STANDARDS

A. American Institute of Steel Construction (AISC).

1. AISC 303 – Code of Standard Practice for Steel Buildings and Bridges.

B. American Welding Society (AWS)

1. AWS D1.1– Structural Welding Code – Steel.

C. American Society of Mechanical Engineers (ASME).

1. ASME B18.21.1 – Lock Washers (Inch Series).

2. ASME B18.22.1 – Plain Washers.

D. American Society for Testing and Materials (ASTM)

1. ASTM A6 – Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.

2. ASTM A 36 – Carbon Structural Steel.

3. ASTM A53 – Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

4. ASTM A 123 – Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

5. ASTM A 153 – Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

6. ASTM A 307 – Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

7. ASTM A 500 – Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

8. ASTM A 653 – Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

9. ASTM A 780 – Repair of Damaged and Uncoated Areas of Hot-Dipped Galvanized Coatings.

10. ASTM A 786 – Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates.

11. ASTM D 1187 – Asphalt-Base Emulsions for Use as Protective Coatings for Metal.

E. National Association of Architectural Metal Manufacturers (NAAMM)

1. NAAMM MBG 531 – Metal Bar Grating Manual.

F. The Steel Structures Painting Council (SSPC)

1. SSPC SP 3 – Power Tool Cleaning.

2. SSPC SP 6 – Commercial Blast Cleaning.

G. U.S. General Services Administration (GSA)

1. FS TT-P-664 - Primer Coating, Alkyd, Corrosion-Inhibiting, Lead and Chromate Free, VOC-Compliant.

2. FS RR-G-1602 – Grating, Metal, other than Bar Type.

H. U.S. National Archives and Records Administration (NARA)

1. 29 CFR 1910.27 – Fixed Ladders.

1.03 SUBMITTALS

A. Shop Drawings

1. Submit fabrication drawings showing layout(s), connections to structural system, and anchoring details as specified in AISC 303.

2. Submit templates, erection and installation drawings indicating thickness, type, grade, class of metal, and dimensions. Show construction details, reinforcement, anchorage, and installation with relation to the building construction.

1.04 QUALIFICATION OF WELDERS

A. Qualify welders in accordance with AWS D1.1. Use procedures, materials, and equipment of the type required for the work.

1.05 DELIVERY, STORAGE, AND PROTECTION

A. Protect from corrosion, deformation, and other types of damage. Store items in an enclosed area free from contact with soil and weather. Remove and replace damaged items with new items.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Structural Carbon Steel

1. ASTM A 36.

B. Structural Tubing

1. ASTM A 500.

C. Steel Pipe

1. ASTM A 53, Type E or S, Grade B.

D. Gratings

1. Metal plank grating, non-slip requirement, steel ASTM A 653, Z275 G90.

2. Metal bar type grating NAAMM MBG 531.

3. Conform to Barrier Free Requirements where applicable.

E. Floor Plates, Patterned

1. ASTM A 786.

2. Steel plate shall not be less than 14 gage.

F. Anchor Bolts

1. ASTM A 307.

2. Where exposed, shall be of the same material, color, and finish as the metal to which applied.

G. Washers

1. Provide plain washers to conform to ASME B18.22.1. Provide beveled washers for American Standard beams and channels, square or rectangular, tapered in thickness, and smooth. Provide lock washers to conform to ASME B18.21.1.

2.02 FABRICATION FINISHES

A. Galvanizing

1. Hot-dip galvanize items specified to be zinc-coated, after fabrication where practicable. Galvanizing: ASTM A 123, ASTM A 153 or, ASTM A 653, Z275 G90, as applicable.

B. Galvanize

1. Anchor bolts, grating fasteners, washers, and parts or devices necessary for proper installation, unless indicated otherwise.

C. Repair of Zinc-Coated Surfaces

1. Repair damaged surfaces with galvanizing repair method and paint conforming to ASTM A 780 or by application of stick or thick paste material specifically designed for repair of galvanizing. Clean areas to be repaired and remove slag from welds. Heat surfaces to which stick or paste material are applied, with a torch to a temperature sufficient to melt

the metallic in stick or paste; spread molten material uniformly over surfaces to be coated and wipe off excess material.

D. Shop Cleaning and Painting

1. Surface Preparation: Blast clean surfaces in accordance with SSPC SP 6. Surfaces that will be exposed in spaces above ceiling or in attic spaces, crawl spaces, furred spaces, and chases may be cleaned in accordance with SSPC SP 3 in lieu of being blast cleaned. Wash cleaned surfaces which become contaminated with rust, dirt, oil, grease, or other contaminants with solvents until thoroughly clean. Steel to be embedded in concrete shall be free of dirt and grease. Do not paint or galvanize bearing surfaces, including contact surfaces within slip critical joints, but coat with rust preventative applied in the shop.

2. Pretreatment, Priming and Painting: Apply pretreatment, primer, and paint in accordance with manufacturer's printed instructions. On surfaces concealed in the finished construction or not accessible for finish painting, apply an additional prime coat to a minimum dry film thickness of 1.0 mil. Tint additional prime coat with a small amount of tinting pigment.

2.03 HANDRAILS

A. General

1. Design handrails to resist a concentrated load of 250 lbs in any direction at any point of the top of the rail and 20 lbs per foot, applied horizontally to top of the rail, whichever is more severe. Provide the same size rail and post. Provide pipe collars of the same material and finish as the handrail and posts.

B. Steel Handrails, Including Carbon Steel Inserts

1. Provide steel handrails, including inserts in concrete, steel pipe conforming to ASTM A 53 or structural tubing conforming to ASTM A 500, Grade A or B of equivalent strength.

a. Fabrication: Joint post, rail, and corners by one of the following methods:

(1) Flush-type rail fittings of commercial standard, welded and ground smooth with railing splice locks secured with 3/8 inch hexagonal-recessed-head setscrews.

(2) Mitered and welded joints made by fitting post to top rail and intermediate rail to post, mitering corners, groove welding joints, and grinding smooth. Butt railing splices and reinforce them be a tight fitting interior sleeve not less than 6 inches long.

(3) Railings may be bent at corners in lieu of jointing, provided bends are made in suitable jigs and the pipe is not crushed.

2.04 LADDERS

A. Fabricate vertical ladders conforming to ASTM A6, Section 7 of 29 CFR 1910.27. Use 2 ½ by 3/8 inch steel flats for stringers and ¾ inch diameter steel rods for rungs. Rungs to be not less than 16 inches wide, spaced one foot apart, plug welded or shouldered and headed into stringers. Install ladders so that the distance from the rungs to the finished wall surface will not be less than 7 inches. Provide heavy clip angles riveted or bolted to the stringer and drilled for not less than ½ inch diameter expansion bolts as indicated. Provide intermediate clip angles not over 48 inches on centers.

2.05 SHIP'S LADDERS

A. Fabricate stringers and framing of steel plate or shapes conforming to ASTM A 36. Provide treads with non-slip surface.

2.06 MISCELLANEOUS PLATES AND SHAPES

A. Provide angles and plates, ASTM A 36, for embedment as indicated. Galvanize embedded items exposed to the elements according to ASTM A 123.

2.07 STEEL STAIRS

A. Provide steel stairs complete with stringers, steel-plate reads and risers, metal-pan concrete-filled treads, grating treads; or nonskid metallic treads, landings, columns, handrails, and necessary bolts and other fastenings.

B. Materials

1. Provide steel stairs of welded construction except that bolts may be used where welding is not practicable. Screw or screw-type connections are not permitted.

a. Structural Steel: ASTM A 36.

b. Gratings for Treads and Landings: ASTM A 653, Z275 G-90 for steel; provide gratings with non-slip nosing. Slip resistance shall meet test requirements of FS RR-G-1602.

c. Support steel floor plate, metal pan for concrete fill, steel grating on angle cleats welded to stringers or treads with integral cleats, welded or bolted to the stringer. Provide sheet-steel landings with angle stiffeners welded on. Close exposed ends. Exterior stairs shall have all exposed joints formed to exclude water.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install items at locations indicated, according to manufacturer's instructions. Items listed below require additional procedures.

3.02 ANCHORAGE, FASTENINGS, AND CONNECTIONS

A. Provide anchorage where necessary for fastening miscellaneous metal items securely in place. Include for anchorage not otherwise specified or indicated slotted inserts, expansion shields, and power driven fasteners, when approved for concrete; toggle bolts and through bolts for masonry; machine and carriage bolts for steel; through bolts, lag bolts, and screws for wood. Do not use wood plugs in any material. Provide non-ferrous attachments for non-ferrous metal. Make exposed fastenings of compatible materials, generally matching in color and finish, to which fastenings are applied. Conceal fastenings where practicable.

3.03 BUILT-IN WORK

A. Form for anchorage metal work built-in with concrete or masonry, or provide with suitable anchoring devices as indicated or as required. Furnish metal work in ample time for securing in place as the work progresses.

3.04 WELDING

A. Perform welding, welding inspection, and corrective welding, in accordance with AWS D1.1. Use continuous welds on all exposed connections. Grind visible welds smooth in the finished installation.

3.05 FINISHES

A. Dissimilar Materials

1. Where dissimilar metals are in contact, protect surfaces with a coat conforming to FS TT-P-664 to prevent galvanic or corrosive action. Where aluminum is in contact with concrete, mortar, masonry, wood, or absorptive materials subject to wetting, protect with ASTM D 1187, asphalt-base emulsion.

B. Field Preparation

1. Remove rust preventive coating just prior o field erection, using a remover approved by the rust preventive manufacturer. Surfaces, when assembled, shall be free of rust, grease, dirt and other foreign matter.

C. Environmental Conditions

1. Do not clean or paint surface when damp or exposed to foggy or rainy weather, when metallic surface temperature is less than 5 degrees F above the dew point of the surrounding air, or when surface temperature is below 45 degrees F or over 95 degrees F.

END OF SECTION

General Notes

1. Steel exposed to weather and exterior steel in a marine environment shall be hot-dip galvanized.

2. Interior steel in areas of high humidity shall be hot-dip galvanized.

3. Special inspections are often overlooked for remote construction sites. The owner or the registered design professional is responsible for ensuring that these inspections are conducted in accordance with the International Building Code, Chapter 17.

SECTION 06100
ROUGH CARPENTRY

PART 1 - GENERAL

1.01 WORK INCLUDES

A. General Framing and Lumber

B. Engineered Wood Products

C. Wood Structural Products

D. Wood Preservative Treatments

E. Fire Retardant Treatment

F. Dimension Lumber

G. Fiberboard Wall Sheathing

H. Gypsum Wall Sheathing

I. Foam Wall Sheathing

J. Underlayment

K. Electrical Backing Panels

1.02 REFERENCE STANDARDS

A. American Forest and Paper Association (AFPA)

B. American Handboard Association (AHA)

C. The Engineered Wood Association (APA)

1. APA A194.1

2. APA PRI-400

D. American Society for Testing and Materials (ASTM)

1. ASTM A 153 – Zinc Coating on Iron and Steel Hardware.

2. ASTM A 307 – Carbon Steel Bolts and Studs.

3. ASTM A 563 – Carbon and Allow Steel Nuts.

4. ASTM A 653 – Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvanized) by the Hot-Dip Process.

5. ASTM C 79 – Treated Core and Non-treated Core Gypsum Sheathing Board.

6. ASTM C 578 – Rigid, Cellular Polystyrene Thermal Insulation.

7. ASTM C 1177 –Glass Mat Gypsum Substrate for Use as Sheathing.

8. ASTM C 1289 – Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board

9. ASTM D 2559 –Adhesives for Structural Laminated Wood Products for Use under Exterior (Wet Use) Exposure Conditions.

10. ASTM D 5055 – Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists.

11. ASTM D 5456

12. ASTM D 5516

13. ASTM D 5664

14. ASTM E 84 – Surface Burning Characteristics of Building Materials.

15. ASTM E 1677 – Air Retarder Material or System for Low-Rise Framed Building Walls.

E. American Wood Preservers' Association (AWPA)

1. AWPA C 2 – Lumber, Timber, Bridge Ties and Mine Ties-Preservative by Pressure Process

2. AWPA C 20 – Structural Lumber Fire-Retardant Treatment by Pressure Processes.

3. AWPA C 27 – Plywood – Fire Retardant Treatment by Pressure Processes.

4. AWPA C 3.1

5. AWPA M 4 – Standard for the Care of Preservatives -Treated Wood Products.

F. U.S. Department of Commerce (DOC)

1. PS 1 – Construction and Industrial Plywood

2. PS 2 –Wood-Based Structural-Use Panels

3. PS 20 – American Softwood Lumber Standard

G. UL Underwriters Lab

1.03 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product.

1. Include data for wood-preservative and fire-retardant treatment from chemical treatment manufacturers and certification by treating plants that materials comply with requirements.

B. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses.

C. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:

1. Treated wood
2. Engineered wood products
3. Foam-plastic sheathing
4. Power-driven fasteners
5. Powder-actuated fasteners
6. Expansion anchors
7. Metal framing anchors
8. Building wrap

PART 2 - PRODUCTS

2.01 MATERIALS

A. Lumber, General: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.

1. Factory mark each piece of lumber with grade stamp of grading agency.

2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.

3. Provide dressed lumber, S4S, unless otherwise indicated.

4. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.

B. Engineered Wood Products: Provide engineered wood products with allowable design stresses, as published by manufacturer that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

C. Wood Structural Panels:

1. Plywood: DOC PS 2
2. Oriented Strand Board: DOC PS 2

D. Wood-Preservative-Treated Materials: AWPA C 2 (lumber), and AWPA C 9 (plywood) for lumber in contact with ground, concrete and masonry. Lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C 31 with inorganic boron (SBX).

1. Kiln-dry material after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.

2. Mark each treated item with the treatment quality mark of an inspection agency approved by the American Lumber Standards Committee Board of Review.

3. Application: Treat items as indicated on Drawings, and the following:

   a. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
   b. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
   c. Wood framing members less than 18 inches above grade.
   d. Wood floor plates that are installed over concrete slabs directly in contact with earth.

E. Fire-Retardant-Treated Materials: Where fire-retardant-treated materials are indicated, provide materials that comply with performance requirements in AWPA C20 (lumber) and AWPA C27 (plywood). Identify fire-retardant-treated wood with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Use treatment for which chemical manufacturer publishes physical properties of treated wood after exposure to elevated temperatures, when tested by a qualified independent testing agency according to ASTM D5664, for lumber and ASTM D5516, for plywood.
2. Use treatment that does not promote corrosion of metal fasteners.
3. Use Exterior type for exterior locations and where indicated.
4. Use Interior Type A High Temperature (HT), unless otherwise indicated.

F. Dimension Lumber: Provide dimension lumber of grades indicated according to the American Lumber Standards Committee National Grading Rule provisions of the grading agency indicated.

1. Non-Load-Bearing Interior Partitions: No. 2 grade, Douglas Fir.
2. Framing Other Than Non-Load-Bearing Partitions: No. 2 grade, Douglas Fir, and stress grade as indicated on the drawings.

G. Laminated-Veneer Lumber: Composite wood veneers with grain primarily parallel to member lengths, manufactured with an exterior-type adhesive complying with ASTM D 2559. Product has the following allowable design values as determined according to ASTM D 5456:

1. Extreme Fiber Stress in Bending, Edgewise: As indicated on the Drawings for 12 inch nominal depth members.

2. Modulus of Elasticity, Edgewise: As indicated on the Drawings.

H. Wood I-Joists: Prefabricated units complying with APA PRI-400; depths and performance ratings not less than those indicated.

1. Web Material: Either oriented strand board or plywood, Exposure
2. Structural Capacities: Establish and monitor structural capacities according to ASTM D 5055.
3. Trademark: Factory mark I-joists with APA trademark indicating nominal joist depth, joist class, span ratings, mill identification, and I-joist compliance with APA standard.

I. Plywood Wall sheathing: Exterior, Structural I.

J. Oriented-Strand-Board Wall Sheathing: Exposure 1, Structural I.

K. Fiberboard Wall Sheathing: AHA A194.1, Type IV, Class 1 (regular density cellulosic fiberboard sheathing with square edges.

L. Paper-Surfaced Gypsum Wall Sheathing: ASTM C 79, with water-resistant material incorporated into the core and with water-repellent paper bonded to core's face, back, and long edges.

1. Type and Thickness: As noted on the drawings.
2. Edge and End Configuration: Square

M. Glass-Mat Gypsum Wall Sheathing

1. Product: ASTM C 1177.
2. Type and Thickness: As indicated on the drawings.

N. Extruded-Polystyrene-Foam Wall Sheathing: ASTM C 578, Type IV, in manufacturer's standard lengths and widths with tongue-and-groove or shiplap long edges as standard with manufacturer.

O. Polyisocyanurate-Foam Wall sheathing: Aluminum-foil-faced, glass-fiber-reinforced, rigid, cellular, polyisocyanurate thermal insulation complying with ASTM C 1289, Type I, Class 2. Foam-plastic core and facings shall have a flame-spread index of 25 or less when tested individually.

P. Plywood Roof Sheathing: Exterior, Structural I sheathing.

Q. Oriented-Strand-Board, Combination Sub-Floor-Underlayment: Exposure 1 single-floor panels.

R. Plywood Sub-Flooring: Exterior, Structural I, single-floor panels or sheathing.

S. Oriented-Strand-Board Sub-Flooring: Exposure 1, Structural I sheathing.

T. Plywood Underlayment for Resilient Flooring: DOC PS 1, Exterior A-C with fully sanded face.

U. Plywood Underlayment for Carpet: DOC PS 1, Exterior, C-C Plugged.

V. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than ½ inch thick.

W. Fasteners: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacturer.

1. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153.
2. Bolts: Steel bolts complying with ASTM A 307, Grade A, with ASTM A 563 hex nuts and, where indicated, flat washers.

X. Metal Framing Anchors: Provide framing anchors made from hot-dip, zinc coated steel sheet complying with ASTM A 653, G60 coating designation, of structural capacity, type, and size indicated, and as follows:

1. Research/Evaluation Reports: Provide products acceptable to authorities having jurisdiction and for which model code research/evaluation reports exist that show compliance of metal framing anchors, for application indicated, with building code in effect for Project.
2. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

Y. Building Wrap: Air-retarder sheeting made from polyolefins; cross-laminated films, woven strands, or spun-bonded fibers; coated or uncoated; with or without perforations; and complying with ASTM E 1677, Type I.

1. Thickness: Not less than 3 mils.
2. Permeance: Not less than 10 perms (575 ng/Pa x s x sq. m).
3. Flame-Spread Index: 25 or less per ASTM E 84.
4. Allowable Exposure Time: Not less than three months.

Z. Sealing Accessories

1. Building Wrap Tape: Pressure-sensitive plastic tape recommended by building wrap manufacturer for sealing joints and penetrations in building wrap.
2. Sheathing Tape: Pressure-sensitive plastic tape for sealing joints and penetrations in sheathing and recommended by sheathing manufacturer for use with type of sheathing required.
3. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form for use as a sill sealer; 1-inch nominal thickness compressible to 1/32 inch; selected from manufacturer's standard widths to suit width of sill members indicated.

PART 3 - EXECUTION

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and plywood.

C. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. Published requirements of metal framing anchor manufacturer.

2. Table 2304. a. 1, Fastening Schedule in the International Building Code.

D. Framing Standard: Comply with AFPA's "Manual for Wood Frame Construction," unless otherwise indicated.

E. Fastening Methods: Fasten panels as indicated below:

1. Sub-flooring: Glue and screw to wood framing.
2. Sheathing: Nail to wood framing.
3. Underlayment: Nail to sub-flooring.
4. Plywood Backing Panels: Nail or screw to supports.

F. Apply building paper horizontally with 2-inch overlap and 6-inch end lap; fasten to sheathing with galvanized staples or roofing nails. Cover upstanding flashing with 4-inch overlap.

G. Building Wrap Application: Cover wall sheathing with building wrap as indicated. Cover upstanding flashing with 4-inch overlap. Seal seams, edges, and penetrations with tape.

H. Apply sheathing tape to joints between sheathing panels and at items penetrating sheathing. Apply at upstanding flashing to overlap both flashing and sheathing.

END OF SECTION

General Notes

1. Fire-retardant treated plywood may be used for non-structural applications which are not subject to elevated temperatures or high humidity.

2. Fire retardant treated plywood shall not be used in any part of the roof or roofing system.

SECTION 06200
FINISH CARPENTRY

PART 1 - GENERAL

1.01 WORK INCLUDES

A. Interior Carpentry

B. Exterior Carpentry

1.02 REFERENCE STANDARDS

A. American Hardboard Association (AHA)

1. AHA A135.6 – Hardboard Siding.

B. American Wood-Preserver's Association (AWPA)

1. AWPA C9 – Plywood – Preservative Treatment by Pressure Processes.

2. AWPA C20 – Structural Lumber Fire-Retardant Treatment by Pressure Processes.

3. AWPA C27 – Plywood – Fire-Retardant Treatment by Pressure Processes.

4. AWPA M4 – Standard for the Care of Preservative-Treated Wood Products.

5. AWPA P5.

C. American Society for Testing and Materials (ASTM)

1. ASTM D 2898 – Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing.

2. ASTM F 547 – Nails for Use with Wood and Wood-Base Materials.

D. Western Wood Products

1. WWPA MA.

1.03 SUBMITTALS

A. Product Data:

Siding:
Epoxy-Aggregate Panels;

1. Manufacturer's printed data, showing texture, density, catalog cuts, and installation instructions.

Wood Items, Siding, and Trim;

Manufacturer's printed data indicating the usage of engineered or recycled wood products, and environmentally safe preservatives.

B. Samples

Siding:
Wood Shingles;
Moldings;
Fascias and Trim;

1. Samples shall be of sufficient size to show patterns, color ranges, and types, as applicable, of the material proposed to be used.

1.04 DELIVERY AND STORAGE

A. Materials shall be delivered to the site in undamaged condition, stored off ground in fully covered, well-ventilated areas, and protected from extreme changes in temperature and humidity.

PART 2 - PRODUCTS

2.01 WOOD ITEMS, SIDING, AND TRIM

A. Grading and Marking

1. Materials shall bear the grademark, stamp or other identifying marks indicating grades of material and rules or standards under which produced. Such identifying marks on a material shall be

in accordance with the rule or standard under which the material is produced, including requirements for qualifications and authority of the inspection organization, usage of authorized identification, and information included in the identification. The inspection agency for lumber shall be certified by the Board of Review, American Lumber Standards Committee, to grade the species used. Except for plywood, wood structural panels, and lumber, bundle marking will be permitted in lieu of marking each individual piece. Surfaces that are to by architecturally exposed to view shall not bear grademarks, stamps, or other types of identifying marks.

B. Sizes and Patterns

1. Lumber sizes and patterns shall conform to rules or standards under which produced. Unless otherwise specified, lumber shall be surfaces on four sides. Sizes and patterns for materials other than lumber shall conform to requirements, unless otherwise specified, are nominal sizes, and actual sizes shall be within manufacturing tolerances allowed by the standard under which the product is produced.

C. Moisture Content

1. The maximum moisture content of untreated trim and wood siding shall be 15 percent at the time of delivery to the jobsite and when installed. Moisture content of all other material shall be in accordance with the standard under which the product is produced.

D. Preservative Treatment

1. Plywood shall be treated in accordance with AWPA C9 with waterborne preservatives listed in AWPA P5 to a retention level as follows:

   a. 0.25 pcf intended for above ground use.

   b. 0.4 pcf intended for ground contact and fresh water use.

2. Exterior Wood Molding and Millwork wihin18 inches of soil, in contact with water or concrete shall be preservative-treated in accordance with WWMPA WM 6. Exposed areas of treated wood that are cut or drilled after treatment shall receive a field

treatment in accordance with AWPA M4. Items of all-heart material of cedar, cypress, or redwood will not require preservative treatment, except when in direct contact with soil.

E. Fire-Retardant Treatment

1. Fire-retardant treated lumber shall be pressure treated in accordance with AWPA C20. Fire-retardant treated plywood shall be pressure treated in accordance with AWPA C27. Material use shall be defined in AWPA C20 and AWPA C27 for Interior Type A and B and Exterior Type. Treatment and performance inspection shall be by a qualified independent testing agency that establishes performance ratings. Each piece or bundle of treated material shall bear identification of he testing agency to indicate performance with such rating. Treated materials to be exposed to rain wetting shall be subjected to an accelerated weathering technique in accordance with ASTM D 2898, Method A, prior to being tested for compliance with AWPA C20 or AWPA C27. Items to be treated shall be included in accordance with design requirements.

F. Siding

1. General

a. Horizontal siding shall be hardboard, plywood, wood structural panel, wood or vinyl. Panel siding shall be hardboard, wood structural panel, or plywood.

2. Horizontal Hardboard Siding

a. Horizontal hardboard siding shall be made from basic hardboard specified in AHA A135.6, factory primed face and longitudinal edges, factory applied back, lap type, width and thickness, in accordance with design requirements. Maximum practicable lengths. Face shall be smooth, embossed or textured.

3. Horizontal Plywood Siding

a. Horizontal plywood siding shall conform to PS1, exterior, medium-density overlay, lap type, maximum practicable lengths, width and thickness in accordance with design

requirements. Face shall be smooth, rough sawn, or textured.

4. Wood Siding

a. Wood siding shall be of the species and grades in accordance with design requirements. Siding shall be minimum 3/16 inch thin edge be minimum 7/16 inch thick edge, horizontal plain lap type, horizontal drop type vertical board, tongue and groove or shiplap on long edges, maximum practicable lengths, smooth, rough-sawn, or textured face.

G. Fascias and Trim

1. Wood fascias and trim, including exterior door and window casing, shall be species and grade in accordance with design requirements. Sizes shall be as indicated.

H. Moldings

1. Moldings shall be of the pattern indicated and shall be of a grade compatible with the finish specified.

2.02 NAILS

A. Nails shall be the size and type best suited for the purpose and shall conform to ASTM F 547. Nails shall be hot-dip galvanized or aluminum when used on exterior work. For siding, length of nails shall be sufficient to extend 1-1/2 inches into supports, including wood sheathing over framing. Screws for use where nailing is impractical shall be size best suited for purpose.

PART 3 - EXECUTION

3.01 GENERAL

A. Installation of Siding - General

1. Siding shall be accurately fitted and positioned without springing or otherwise forcing siding in place. Siding to have a stain finish shall have nails set and stopped with non-staining putty to match finished siding. Siding to have a paint finish shall have nails driven flush.

B. Horizontal Siding

1. End joints shall be made over framing members and be so alternated that at least two boards will be between joints on the same support. Shorter pieces shall be uniformly distributed throughout each area. Starter strips shall be provided as necessary to establish proper slant for siding. Ends of siding shall be predrilled if necessary to prevent splitting when nailed. Horizontal bevel or plain lap siding shall be overlapped when nailed into each support in accordance with approved recommendations of the siding manufacturer. Horizontal drop siding shall have each course fully worked into the top edge of the previous course, and shall be nailed into each support with two nails, one near the lower edge to clear top of previous course, and one just above mid-height of course. One nail just above mid-height of course.

3.02 MOLDING AND INTERIOR TRIM

A. Molding and interior trim shall be installed straight, plumb, level and with closely fitted joints. Exposed surfaces shall be machine sanded at the mill. Molded work shall be coped at returns and interior angles and mitered at external corners. Intersections of flatwork shall be shouldered to ease any inherent changes in plane. Window and door trim shall be provided in single lengths. Blind nailing shall be used to the extent practicable, and face nailing shall be set and stopped with a non-staining putty to match the finish applied. Screws shall be used for attachment to metal; setting and stopping of screws shall be of the same quality as required where nails are used.

END OF SECTION

SECTION 07130
ELASTOMERIC SHEET WATERPROOFING

PART 1 - GENERAL

1.01 WORK INCLUDES

A. Sheet Waterproofing

B. Protection Board

C. Primers, Adhesives, and Mastics

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. ASTM D 41 – Asphalt Primer Used in Roofing, Damproofing, and Waterproofing.

2 ASTM D 146 – Sampling and Testing Bitumen-Saturated Felts and Woven Fabrics for Roofing and Waterproofing.

3. ASTM D 297 – Rubber Products – Chemical Analysis

4. ASTM D 412 – Vulcanized Rubber and Thermoplastic Elastomers – Tension.

5. ASTM D 429 – Rubber Property-Adhesion to Rigid Substrates

6. ASTM D 471 – Rubber Property – Effect of Liquids.

7. ASTM D 570 – Water Absorption of Plastics.

8. ASTM D 573 – Rubber – Deterioration in an Air Oven.

9. ASTM D 624 – Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.

10. ASTM D 638 – Tensile Properties of Plastics.

11. ASTM D 746 – Brittleness Temperature of Plastics and Elastomers by Impact.

12. ASTM D 751 – Coasted Fabrics.

13. ASTM D 903 – Peel or Stripping Strength of Adhesive Bonds

14. ASTM D 1004 – Initial Tear Resistance of Plastic Film and Sheeting.

15. ASTM D 1149 – Rubber Deterioration – Surface Ozone Cracking in a Chamber.

16. ASTM D 1204 – Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature.

17. ASTM D 146 – Sampling and Testing Bitumen-Saturated Felts and Woven Fabrics for Roofing and Waterproofing.

18. ASTM D 1876 – Steel Resistance of Adhesive (T-Peel Test).

19. ASTM D 2136 – Coated Fabrics – Low-Temperature Bend Test.

20. ASTM D 3045 – Practice for Heat Aging of Plastics Without Load.

21. ASTM D 5385 – Hydrostatic Pressure Resistance of Waterproofing Membrane.

22. ASTM E 154 – Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.

23. ASTM E 96 – Water Vapor Transmission of Materials.

1.03 SUBMITTALS

A. Product Data

1. Submit product data for each product.

B. Test Reports

1. Elastomeric waterproofing sheet material.

a. Submit data certifying compliance with performance requirements specified herein for elastomeric waterproofing sheet material.

1.04 Manufacturer's Instructions

1. Submit manufacturer's material safety data sheets for primers, adhesives and mastics.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store materials out of the weather, in manufacturer's original packaging with brand name and product identification clearly marked. Do not permit uncertified material in the work area.

1.05 ENVIRONMENTAL CONDITIONS

A. Do not apply waterproofing during inclement weather or when there is ice, frost, surface moisture, or visible dampness on the surface to receive waterproofing and when ambient and surface temperatures are 40 degrees F or below.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General

1. Provide one of the types of elastomeric waterproofing sheet material and related primers, adhesives, and mastics as specified herein. Ensure compatibility of waterproofing materials within a specified type, with each other, and with the materials on which they will be applied. Materials shall conform to the applicable performance requirements cited below when tested in accordance with the referenced ASTM publications.

2.02 BUTYL RUBBER SHEETING

A. Butyl Rubber Sheeting Performance Requirements.

1. Thickness Tolerance, ASTM D 412: Plus or minus 10 percent.

2. Specific Gravity, ASTM D 297: 1.20, plus or minus 0.05.

3. Tensile Strength, ASTM D 412: 1,200 psi minimum.

4. Tensile Stress at 300 percent elongation, ASTM D 412: 600 psi minimum.

5. Elongation, ASTM D 412: 300 percent minimum.

6. Tear Resistance, Die C, ASTM D 624: 150 pound force per inch (lbf/inch) minimum.

7. Shore A Hardness, ASTM D 2240: Five-second interval before reading: 60 plus or minus 10.

8. Ozone Resistance, ASTM D 1149: No cracks, 7 days, 100 degrees F, 20 percent elongation.

9. Heating Aging-Accelerated, ASTM D 573: Tensile retention, 60 percent of minimum original elongation retention; 60 percent of minimum original requirement; 7 days, 240 degrees F.

10. Butyl Identification, ASTM D 471, Tricresyl Phosphate Immersion: Maximum volume swell 10 percent, 70 hrs, 212 degrees F.

11. Low Temperature Flexibility, ASTM D 746: No failure at C -40 degrees F.

12. Water Absorption, ASTM D 471: +1 percent maximum, 7 days, 158 degrees F.

13. Exposure to Fungi and Bacteria in Soil, ASTM E 154, Minimum 16 weeks: Unaffected.

14. Water Vapor Transmission, 80 Degrees F Permeance, ASTM E 96, Procedure B or BW: 8.58 x 10-7, 0.15 perms maximum.

15. Thickness 60 mils.

B. Adhesive, Cement, and Type for use with Butyl Rubber

1. As recommended by the butyl rubber waterproofing membrane manufacturer.

2.03 THERMOPLASTIC MEMBRANE: POLYVINYL CHLORIDE (PVC)

A. Thermoplastic Membrane Performance Requirements

1. Overall thickness, ASTM D 751: .059 inches min.

2. Tensile strength ASTM D 638: 1,600 psi. min.

3. Elongation at break, ASTM D 638: 250 percent min.

4. Seam strength, ASTM D 638: 90 percent minimum of tensile strength.

5. Retention of properties after heat aging, ASTM D 3045.

6. Tensile strength, ASTM D 638: 95 percent of original.

7. Elongation, ASTM D 638: 95 percent of original.

8. Tear Resistance, ASTM D 1004: 17 pound force.

9. Low Temperature Bend, ASTM D 2136: -40 F.

10. Liner Dimensional Change, ASTM D1204: 0.002 percent.

11. Weight Change after Immersion in Water, ASTM D 570: 2.0 percent maximum.

B. Adhesive

1. Adhesive for thermoplastic flashing as recommended by manufacturer.

2. Adhesive for Sub-Membrane Grid: 100% solid, two-part urethane, with minimum tensile strength of 150 psi, in accordance with ASTM D 412 and adhesion to concrete of 12 ply in accordance with ASTM D 429 as recommend by manufacturer.

C. Accessories

1. Securement Strip: 14 gauge stainless steel metal bar, 1 inch wide, pre-punched 1 inch on center for securement.

2.04 COMPOSITE, SELF-ADHERING MEMBRANE SHEETING

A. Composite, cold applied, cross laminated, high density polyethylene film not less than 60 mils thickness.

1. Tensile Strength, ASTM D 412: 250 psi minimum.

2. Ultimate Elongation, ASTM D 412: 200 percent minimum.

3. Water Vapor Transmission, ASTM E, 80 degrees F, Permeance, Procedure B: 5.72 x 10-7, 0.1 perm maximum.

4. Pliability Degrees F, ASTM D 146: 180 degrees Bend Over, one inch mandrel: No cracks a minus -25 degrees F.

5. Cycling Over Crack at Minus 15 degrees F: Membrane is applied and rolled across two primed concrete blocks with no separation between blocks. Crack opened and closed from zero to ¼ inch. No effect at 100 cycles.

6. Puncture Resistance, ASTM E 154: 40 pounds minimum.

7. Lap Adhesion at Minimum Application Temperature, ASTM D 1876 Modified, 5 lbs/in.

8. Peel Strength, ASTM D 903: Modified, 9 lbs/n.

9. Resistance to Hydrostatic Head, ASTM D 5385: 231 ft. of water.

10. Water Absorption, ASTM D 570: 0.1% maximum.

11. Thickness: 60 mil.

B. Primer

1. Asphalt composition, ASTM D 41, or synthetic polymer in solvent as recommended by the membrane manufacturer.

C. Mastic

1. Polymer modified asphalt in suitable solvent of trowel-grade consistency and as recommended by the membrane manufacturer.

2.05 REGULAR PROTECTION BOARD – POLYMERIC GRID PROTECTION

A. Provide protection board that is compatible with the waterproofing membrane. Use a minimum ½ inch thick fir bituminous - impregnated board, 1 inch for polystyrene, 1/8 inch thick for vertical and ¼ inch for

horizontal pre-molded bituminious protection board as recommended by the manufacturer.

B. Three-dimentional, high impact resistant polymeric grid with woven monofilament drainage fabric bonded to the grid.

PART 3 - EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Before starting the work, verify that surfaces to be waterproofed are in satisfactory condition. Do not start application until defects and conditions have been corrected.

3.02 SURFACE PREPARATION

A. General

1. Ensure surfaces to be treated are clean, dry, smooth, and free from deleterious materials and projections. Thoroughly wet holes, joints, cracks, and voids in masonry concrete with water and fill with Portland cement mortar, strike flush, and permit to dry. Cut off high spots or grind smooth. Finfish top surfaces of projecting masonry or concrete ledges below grade, except footings, to a steep bevel with Portland cement mortar. Sweep surfaces to be covered before applying waterproofing to remove dust and foreign matter. Cure concrete by a method compatible with the waterproofing system.

3.03 APPLICATION

A. General

1. Follow manufacturer's printed installation instructions. Where indicated, mop continuous cant strips in place at vertical and horizontal corners before installing the waterproofing membrane. Do not use untreated wood or wood fiber cants. Carry waterproofing of horizontal surfaces up abutting vertical surfaces as indicated and adhere solid to the substrate. Avoid wrinkles and buckles in applying membrane and joint reinforcement.

2. Non-Self-Adhering Membrane: Unroll membrane and allow to remain flat for at least one-half hour before application. Apply an asphalt concrete primer prior to application of asphaltic adhesive.

Where solvent adhesive is applied, allow major portion of solvent to evaporate so that bonding adhesive does not stick to a dry finger touching it. Apply elastomeric waterproofing membrane in a full

bed of adhesive at a uniform coverage rate in accordance with the recommendations in the membrane manufacturer's printed instructions. Where membrane on horizontal surfaces are to receive concrete fill, apply adhesive in 4 inch wide strips at 2 feet on center. Pull membrane tight without stretching. As soon as adhesive is fully set and dry, recheck lap splices. Where openings or fishmouths appear, reseal and reroll lap splices.

3. Self-Adhering Membrane: Apply composite, self-adhering membrane on surfaces primed at a uniform coverage rate in accordance with membrane manufacturer's printed instructions. Remove release sheet and apply with tacky surface in contact with dried primer.

4. Protection: Protect membrane over horizontal surfaces from abnormal traffic during installation. Use only equipment with rubber tires. Provide walkway protection where heavy traffic from other trades is expected. Do not store material on membrane.

B. Butyl Rubber

1. Lap sheets at sides and ends a minimum of 6 inches over the preceding sheet. Apply lap splicing cement over entire 6 inches splice area prior to application of sealant. Sealant shall be continuous bead of sealant at all membrane splices or as required by the manufacturer. When membrane will be below water table, provide a tongue and groove cemented splice a minimum of 6 inches with factory made heat vulcanized seam not less than 2 inches or as required by the manufacturer.

C. Thermoplastic Membrane (PVC)

1. Deck shall be clean, smooth and dry without surface irregularities. Consult with membrane manufacturer prior to grid application. Install 12 inches wide sub-membrane containment grid as required by manufacturer. Provide and install he containment grid at intervals across the width and length of the substrate, at the base of all transitions, walls, curbs, penetrations, and at the perimeter of each deck/substrate section. Fully adhere strips to the deck in a full bedding of two-part urethane adhesive medium. Adjacent

sheet shall be welded in accordance with manufacturer's instructions. All side and end lap joints shall be hot-air welded. Lap area shall be a minimum of 3 inches wide when machine welding, and a minimum of 4 inches wide when hand welding, but

not less than recommended by the manufacturer. Overlaps shall be with the flow of water.

D. Composite, Self-Adhering Membrane

1. Lap sheets at edges and ends a minimum of 2 ½ inches over the preceding sheet. All side laps shall be minimum 2 ½ inches and end laps shall be 5 inches. Laps shall be self adhesive, mastic as per manufacturer's recommendation. Roll or firmly press to adhere membrane to substrate. Cover corners and joints with two layers of reinforcement by first applying a 12 inch width of membrane centered along the axis. Flash drains and projections with a second ply of membrane for a distance of 6 inches from the drain or projection. Finish exposed, terminated edges of membrane on horizontal or vertical surfaces with a trowelled bead of mastic. Apply mastic around edges of membrane, and drains and projections. Apply mastic at end of each work day.

3.04 FLASHING

A. Flash penetrations through membrane. Ensure that where reinforcing bars penetrate a waterproofing membrane, each of those penetrations be sealed with the appropriate sealant or mastic flashing component. Embed elastomeric membrane in a heavy coat of adhesive, except for self-adhering membrane. Continuous metal reglets shall be installed, horizontally on footing and vertically on intersecting and connecting walls. Metal reglets shall receive exposed edges of membrane waterproofing. Secure membrane into reglets by lead wedges and fill with cement as recommended by manufacturer of waterproofing and protective covering.

3.05 PROTECTIVE COVERING

A. After installation apply a protective covering to the membrane waterproofing prior to backfilling. Protect vertical membrane waterproofing with a ½ inch minimum thickness of asphalt plank; ½ inch minimum thickness of fiberboard; or 1/8 inch minimum thickness of compatible water-resistant bitumen type protection board with edges abutting adjacent edges and exposed surfaces

covered by a taping system recommended by manufacturer of protection board. Cover horizontal membrane waterproofing with similar protection board and Portland cement mortar not less than ¾ inch tick; place uniformly and allow to set before installing subsequent construction.

END OF SECTION

General Notes

1. *Application of waterproofing system shall not be placed over concrete before curing process has occurred.*

2. *Waterproof subject to abuse shall be specified with a puncture resistance of 200 pound minimum.*

3. *Specify polymeric grid for protection of waterproof membrane where ground water is anticipated.*

4. *Bituminous impregnated board may not be used in contact with polyvinyl chloride membranes.*

5. *Curing compound containing wax or oil shall be removed from contact prior to application of waterproofing system.*

6. *Where rigid insulation is applied over waterproofing on below grade foundations the rigid insulation may be substituted for regular protection board.*

SECTION 07200
BUILDING INSULATION

PART 1 - GENERAL

1.01 GENERAL

A. Flexible Batt/Blanket Thermal Insulation.

B. Sound Control Insulation.

C. Vapor Retarder.

1.02 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM C 665 – Mineral/Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

2. ASTM E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials.

3. ASTM E 136 – Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C.

B. Underwriters Laboratories, Inc. (UL)

1. UL 181 – Standard for Factory-Made Air Ducts and Air Connectors.

1.03 SUBMITTALS

A. Product Data:
Manufacturer's data sheets on each product to be used including:

1. Test data showing compliance of products with specified requirements.

2. Preparation instructions and recommendations.

3. Storage and handling requirements and recommendations.

4. Installation methods.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging with identification labels intact until ready for installation.

B. Store products in protected area not exposed to weather and at temperature conditions recommended by manufacturer.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Polyethylene-Wrapped Sound Control Batt Insulation: Flexible blankets made of inorganic glass fibers bonded with formaldehyde-free thermosetting resin, complying with ASTM C 665, and with glass fiber portion classified as noncombustible when tested in accordance with ASTM C 136, wrapped with polyethylene.

1. Thickness: In accordance with design requirements

2. Size: 24 inches by 48 inches

3. Surface Burning Characteristics: Flame spread index of 25 or less; smoke developed index of 50 or less; when tested in accordance with ASTM E 84 with specified facing.

4. Thermal Resistance (R-value): In accordance with design requirements

B. Sound Control Batt Insulation: Flexible, unfaced blankets made of inorganic glass fibers bonded with formaldehyde-free thermosetting resin, complying with ASTM C 665, and classified as noncombustible when tested in accordance with ASTM C 136.

1. Thickness: In accordance with design requirements

2. Size: 16 inches by 96 inches, for pressure fit without fasteners.

3. Size: 24 inches by 96 inches, for pressure fit without fasteners.

4. Surface Burning Characteristics: Flame spread index of 25 or less; smoke developed index of 50 or less; when tested in accordance with ASTM E 84 with specified facing.

5. Air Erosion Resistance: Satisfactory up to 1,000 ft/min when tested in accordance with UL 181.

6. Thermal Resistance (R-value): In accordance with design requirements

C. Batt/Blanket Insulation: Flexible, unfaced blankets made of inorganic glass fibers bonded with formaldehyde-free thermosetting resin, complying with ASTM C 665 and with glass fiber portion classified as noncombustible when tested in accordance with ASTM C 136.

1. Thickness: In accordance with design requirements

2. Size: 16 inches by 96 inches

3. Size: 24 inches by 48 inches

4. Size: 24 inches by 96 inches

5. Surface Burning Characteristics: Flame spread index of 25 or less; smoke developed index of 50 or less; when tested in accordance with ASTM E 84 with specified facing.

6. Air Erosion Resistance: Satisfactory up to 1,000 ft/min when tested in accordance with UL 181.

D. Tape: Self-adhesive vapor retarder tape with flame spread index of 25 or less, smoke developed index of 50 or less.

E. Separate Vapor Retarder: Vapor permeance not more than 1 perm; flame spread index of 25 or less, smoke developed index of 50 or less.

PART 3 - EXECUTION

3.01 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Cover entire area to be insulated, without voids. Fit insulation tightly at edges, joints, and penetrations.

C. Where taped joints are specified, completely seal joints between adjacent vapor retarders and between vapor retarders and adjacent construction.

D. Install insulation adjacent to lighting fixtures, fans, furnaces, electric motors, and other heat-generating devices in accordance with the requirements of authorities having jurisdiction.

E. Install sound control insulation in manner to achieve and maintain the sound ratings specified.

3.03 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products after Substantial Completion.

END OF SECTION

General Notes

1. Consider using a 10 mil vapor barrier for use on assemblies with batt insulation.

SECTION 07310
ASPHALT SHINGLES

PART 1 - GENERAL

1.01 WORK INCLUDES

A. Asphalt Shingles

B. Asphalt Roll Roofing

C. Self Adhering Membrane

1.02 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM D 41 – Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.

2. ASTM D 224 – Smooth –Surfaced Asphalt Roll Roofing (Organic Felt).

3. ASTM D 226 – Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.

4. ASTM D 1970 – Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.

5. ASTM D 3018 – Class A Asphalt Shingles Surfaced With Mineral Granules.

6. ASTM D 3462 – Asphalt Shingles Made From Glass Felt and Surfaced with Mineral Granules.

7. ASTM D 4586 – Tensile Properties of Geotextiles by the Wide-Width Strip Method.

8. ASTM D 4869 – Asphalt-Saturated Organic Felt Underlaymend Used in Steep Slope Roofing.

B. National Roofing Contractors Association (NRCA)

1. NRCA Shingle Manual – Asphalt Shingle Roofing Manual

C. Underwriter's Laboratory (UL)

1. UL 790 – Tests for Fire Resistance of Roof Covering Materials.

2. UL 997 – Wind Resistance of Prepared Roof Covering Material.

1.03 DEFINITIONS

A. Top Lap

1. That portion of shingle overlapping shingle in course below.

B. Head lap

1. The triple coverage portion of top lap which is the shortest distance from the butt edge of an overlapping shingle to the upper edge of a shingle in the second course below.

C. Exposure

1. That portion of a shingle exposed to the weather after installation.

1.04 SUBMITTALS

A. Product Data

1. Submit data including type, weight, class, UL labels, for shingles underlayment, and eave flashing.

B. Manufacturer's Instructions

1. Submit installation instructions.

1.05 DELIVERY AND STORAGE

A. Deliver materials in the manufacturer's unopened bundles and containers bearing the manufacturer's brand name. Keep materials dry, completely covered, and protected from the weather. Store according to manufacturer's written instructions. Roll goods shall be stored on end in

an upright position or in accordance with manufacturer's recommendations. Immediately before laying, roofing felt shall be stored for 24 hours in an area maintained at a temperature not lower than 50 degrees F.

1.06 WARRANTIES

A. Manufacturer's Warranty

1. Furnish the asphalt shingle manufacturer's standard 5 year warranty for the asphalt shingles.

B. Contractor's Warranty

1. The Contractor shall warrant for 5 years that the asphalt shingle roofing system, as installed, is free from defects in workmanship. When repairs due to defective workmanship are required during the Contractor's warranty period, the Contractor shall make such repairs within 72 hours of notification. When repairs are not performed within the specified time, emergency repairs performed by others will not void the warranty.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Shingles

1. Mineral granule-surfaced asphalt shingles, self-sealing, square tab, strip fungus-resistant. ASTM D 3018, Type I, and ASTM D 3462 weighing not less than 210 pounds per 100 square feet, architectural shingles weighing not less than 290 pounds per 100 square feet. Shingles shall meet the fire resistance requirements of UL 790 for Class A and the wind resistance requirements of UL 997.

B. Underlayment

1. Asphalt-saturated felt conforming to ASTM D 4869, ASTM D 224, or ASTM D 226, without perforations or other material specified by the shingle manufacturer for use as underlayment.

C. Leak Barrier Underlayment

1. Self-adhering leak barrier or ice dam underlayment shall comply with ASTM D 1970 for sealability around nails.

D. Self-Adhering Membrane

1. Self-Adhering rubberized asphaltic membrane, a minimum of 40 mils thick, and recommended by the shingle manufacturer for use as eaves flashing.

E. Nails for Applying Shingles and Asphalt-Saturated Felt

1. Aluminum or hot-dipped galvanized steel or equivalent corrosion resistant with sharp points and flat heads 3/8 to 7/16 inch in diameter. Shank diameter of nails shall be a minimum of 0.105 inch and a maximum 0.135 inch with garb or otherwise deformed for added pull-put resistance. Nails shall be long enough to penetrate completely through or extend a minimum of ¾ inch into roof deck, whichever is less, when driven through materials to be fastened.

F. Asphalt Roof Cement

1. ASTM D 4586, Type II.

G. Asphalt Primer

1. ASTM D 41.

Part 3 - EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Ensure that roof deck is smooth, clean, dry, and without loose knots. Roof surfaces shall be firm and free from loose boards, large cracks, and projecting ends that might damage the roofing. Vents and other projections through roofs shall be properly flashed and secured in position, and projecting nails shall be driven flush with the deck.

3.02 SURFACE PREPARATION

A. Cover knotholes and cracks with sheet metal nailed securely to sheathing Flash and secure vents and other roof projections, and drive projecting nails firmly home.

3.03 APPLICATION

A. Apply roofing materials as specified herein unless specified or recommended otherwise by shingle manufacturer's written instructions.

1. Underlayment: Apply one layer of shingle underlayment to roof deck. Lay underlayment parallel to roof eaves, starting at eaves. Provide minimum 2 inch head laps, 4 inch end laps, and 6 inch laps from both sides over hips and ridges. Nail sufficiently to hold until shingles are applied. Turn up vertical surfaces a minimum of 4 inches.

B. Drip Edges

1. Provide metal drip edges applied directly on the wood deck at eaves and over the underlayment at rakes. Extend back from edge of deck a minimum of 3 inches, and secure with nails spaced a maximum of 6 inches o.c. along inner edge.

C. Starter Strip

1. Apply starter strip at eaves, using 9 inch wide strip of mineral-surfaced roll roofing of a color to match shingles. Optionally, use a row of shingles with tabs removed and trimmed to ensure that joints are not exposed at shingle cutouts. Apply starter strip along eaves, overhanging the metal drip edge at eaves and rake edges ¼ inch o 3/8 inch; fasten in a line parallel to 3 to 4 inches above eave edge. Place nails so top of nail is not exposed in cutouts of first course of shingles. When roll roofing is provided, seal tabs of firs course of shingles with asphalt roof cement.

D. Shingle Courses

1. Start first source with full shingle, and apply succeeding courses with joints staggered at thirds of halves. Butt-end joints of shingles shall not align vertically more often than every fourth course. Apply shingle courses as follows:

a. Fastening: Do not drive fasteners into or above the factory-applied adhesive unless adhesive is located 5/8 inch or closer to top of cutouts. Place fasteners so they are concealed by shingle top lap and penetrate the head lap.

b. Shingles applied with nails: 5 inch exposure. Apply each shingle with minimum of four nails. Place one nail one inch from each end, and evenly space nails on a horizontal line a minimum of 5/8 inch above top of cutouts. Cement each tab with one spot of asphalt roof cement placed 1 to 2 inches from bottom edge of shingle.

c. Nailing: Apply shingles with nominal 5 inch exposure. Apply each shingle with minimum of six nails. Place one nail one inch from each end and one nail on each side of each cutout, on a horizontal line 5/8 inch above cutouts.

d. Sealing: Seal each tab with continuous, 9 inch long, ¼ inch diameter bead of asphalt roof cement, applied to the surface of course below. Place bead on horizontal line 5/8 inch above cutouts so bead will be one inch from bottom edge of tab to be sealed and so bead will not show through cutouts. After nailing each shingle, press tabs down to ensure spreading and bonding of asphalt roof cement.

E. Hips and Edged

1. Form with 9 by 12 inch individual shingles or with 12 by 12 inch shingles cut from 12 by 36 inch strip shingles. Bend shingles lengthwise down center with equal exposure on each side of hip or ridge. Lap shingles to provide a maximum 5 inch exposure, and nail each side in unexposed area 5-1/2 inches from butt and 1 inch in from edge.

F. Valleys

1. Closed Cut Valleys

a. Provide 36 inch wide valley lining of single layer of smooth-surfaced or mineral-surfaced roll roofing, with mineral-surface facing down, for full length of valley as follows:

1.) Center lining in valley over underlayment. Provide minimum 12 inch end laps in the lining and seal laps with asphalt roof cement. Fasten lining to hold it in place until shingles are applied.

2.) Apply first regular course of shingles along eaves of one of the intersecting roof planes and across valley. Extend course at least 12 inches onto adjoining roof.

3.) Apply succeeding courses in same manner as first course, extending across valley and onto adjoining roof.

4.) Press shingles tightly into valley and nail in normal manner, except apply nails not closer than 6 inches to valley centerline, and apply additional nail in top corner of each shingle crossing valley.

5.) Apply shingles on the adjoining roof plane, starting along eaves and across valley onto previously applied shingles. Trim overlapping courses back to a line parallel to and a minimum of 2 inches back from valley centerline.

6.) Trim 1 inch on a 45 degree angle from upper corner of each end shingle. Embed end shingles in a 3 inch wide band of asphalt roof cement.

b. Woven Valleys

1.) Provide valley lining as specified for closed cut valley. Lay valley shingles over lining by either of the following methods:

(a.) Method I: Apply regular shingles on both roofs simultaneously. Weave each course in turn over the valley. Lay the first regular course of shingles along eaves of roof up to and over valley. Extend course along adjoining roof deck at least 12 inches. Carry first regular course of shingles of adjoining

roof over valley on top of previously applied shingles. Lay succeeding courses

alternately, weaving valley shingles over each other for full length of valley.

(b.) Method II: Apply regular shingles on each roof surface separately to a line about 3 feet from center of valley, and weave valley shingles in place

(c.) Press shingles tightly into valley, and fasten in normal manner; except apply nails not closer than 6 inches to valley centerline, and apply additional nail in top corner of terminal shingle on both sides of valley.

G. Flashing

1. Eave Flashing

a. From the eaves to a point 24 inches inside interior wall line, apply one layer of self-adhering membrane. Follow membrane manufacturer's printed installation instructions.

2. Vent and Stack Flashing

a. Apply shingles up to point where vent or stack pipe projects through roof, and cut nearest shingle to fit around pipe. Before applying shingles beyond pipe, prepare flange of metal pipe vent flashing by applying a 1/8 inch thick coating of asphalt roof cement on bottom side of flashing flange. Slip flashing color and flange over pipe, and set coated flange in 1/16 inch coating of asphalt roof cement. After applying flashing flange, continue shingling up roof. Lap lower part of flange over shingles. Overlap flange with side and upper shingles. Fit shingles around pipe, and embed in 1/16 inch thick coating of asphalt roof cement where shingles overlay flange.

END OF SECTION

GENERAL NOTES

1. Asphalt singles not recommended for roof slopes less than 3 inches in 12 inches.

2. Consider application of waterproofing membrane over entire roof deck, in lieu of 15# felt. This allows for a waterproof membrane to protect the building and allows the shingles to be installed in favorable weather conditions. Most manufacturers approve this application in Alaska.

3. When re-roofing buildings ensure that existing decks are sound and fastened properly.

SECTION 07400
PREFORMED METAL ROOFING

PART 1 - GENERAL

1.01 WORK INCLUDES

A. Preformed steel and aluminum roofing including concealed and exposed fastener systems.

1.02 REFERENCE STANDARDS

A. American Architectural Manufacturers Association (AAMA)

B. American Society for Testing and Materials (ASTM).

1. ASTM A 653 – Steel Sheet, Zinc-Coated (galvanized) or Zinc-Iron Alloy-Coated (galvanealled) by the Hot-Dip Process.

2. ASTM A 755 – Steel Sheet, Metallic Coated by the Hot-Dip Process and pre-painted by the Coil-Coating Process for Exterior Exposed Building Process.

3. ASTM B 209 – Aluminum and Aluminum-Alloy Sheet and Plate.

4. ASTM D 1970 – Self-Adhering Polymer Modified Bituminous Sheet Materials as Steep Roofing Underlayment for Ice Dam Protection.

C. American Welding Society (AWS).

D. Federal Standards (FS).

E. The Society for Protective Coatings.

1.03 SUBMITTALS

A. Provide manufacturer's data and installation for arctic conditions. Install roofing in accordance with submittals.

B. Submit complete list of roofing material for approval.

C. Submit shop drawings showing plan and all details and installation methods.

D. Submit maintenance instructions.

E. Submit structural calculations to show compliance with wind pressure in accordance with deign requirements, include calculations addressing uplift. Calculation shall be certified by an engineer licensed in the State of Alaska.

F. Samples shall be submitted.

G. Guarantee: Before final payment, furnish written guarantee, warranting all roofing, flashing, and counter flashings, and other work of this, or other divisions which are a component part of the roofing, to be watertight for a period or two (2) years from and after final acceptance of the building. Guarantee shall be signed by the general contractor, the subcontractor, and the manufacturer. The contractor shall make all repairs necessary to insure a watertight roof during the two year guarantee. Any damage to the building including the interior finish, resulting from roof leaking or failure of any component part of the roof, shall be restored to a new condition by the contractor without delay and the entire expense to be borne by the contractor. The above guarantee is for the materials and workmanship of the entire roofing system and all collateral damage.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Steel Panels : Structural – quality steel sheet galvanized according to ASTM A 653, G90 0.034 inch thick, unless otherwise indicated.

1. Finish; Coil coated with 2-coat fluoropolymer according to ASTM A 755, compose of inhibitive primer and color topcoat containing not less then 70 percent polyvinylidene fluoride resin by weight, with a total minimum dry film thickness of 0.9 mil in color as selected from manufacturer's full range of colors.

B. Aluminum Panels: Smooth, flat, mill-finish aluminum sheet comply with ASTM B 209 for alclad alloy 3003 or 3004, with temper to suit forming operations; 0.032 inch thick, unless otherwise indicated.

1. Finish: Coil coated with 2-coat fluoropolymer composed of inhibitive primer and color topcoat containing not less then 70 percent polyvinylidene fluoride resin by weight, with a total minimum dry film thickness of 0.9 mil complying with AAMA 1402, Test Method No. 7; in color as selected from manufacturer's full range of colors.

C. Lap-Seam Roof Panel Assembly: Designed for mechanical attachment of panels to roof purlins or deck using exposed fasteners and sealants.

D. Standing-Seam Roof Panel Assembly: Designed for concealed mechanical attachment of panels to roof purlins or decks.

1. Clips: 0.0625-inch thick, stainless-steel panel clips designed to meet negative-load requirements.

2. Cleats: Mechanically seamed cleats formed from minimum 0.0250-inch think, stainless-steel or nylon-coated aluminum sheets.

E. Self-Adhering, Polymer-Modified, Bituminous Sheet Underlayment: ASTM D 1970, minimum of 40 mils thick. Provide primer when recommended by underlayment manufacturer.

F. Fasteners: self-tapping screws, both, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand designed to with stand design loads.

G. Closure strips: Closed-cell, self-extinguishing, expanded, cellular, rubber or cross-linked polyolefin-foam strips.

H. Sealing Tape: Pressure-sensitive, polyisobutylene tape with release paper backing.

PART 3 - EXECUTION

3.01 INSTALLATION AND WORKMANSHIP

A. Inspection and Preparation

1. Verify that works of others trades which penetrates roof deck or requires men and equipment to traverse roof deck has been completed.

2. Examine surface for inadequate anchorage of material, moisture and unevenness which would prevent the execution of quality application of siding system.

3. Do not proceed with installation of roofing system until defects are corrected.

B. Installation

1. Prior to commencing work, verify governing dimensions at the project site.

2. Apply waterproofing membrane 8'-0" high on all vertical surfaces adjacent to the roof deck and on decks that abut vertical surface for a distance of eight feet horizontally from the vertical surface.

3. Install preformed metal roofing over waterproofing membranes.

4. Install roofing in strict accordance with manufacturer's recommendations and details for arctic conditions, and to resist local wind and weather conditions, and as a minimum at all edges of preformed panels provide double clips at roof eave and ridge, and first 6'-0" from double clip at eave at and ridge provide clips a maximum of 18 inches on center, provide clips at 4'0" on center elsewhere.

5. Fasten panels to each other and to substrate with manufacturer's recommended fasteners in accordance with approved manufacturer's recommendations, to resist 40 psf wind loads.

3.02 CLEAN UP AND ADJUSTMENTS

A. Repair any and all scratches or mars in metal roof panel surfaces.

B. Remove all debris, and foreign matter from the siding surface and dispose of off-site.

END OF SECTION

General Notes

1. *In marine environments the use of aluminum roofing should be considered.*

2. *In areas with high temperature differentials the use of steel in lieu of aluminum because of the lower coefficient of expansion.*

3. *When re-roofing buildings ensure that existing decks are sound and properly fastened.*

SECTION 07840
FIRESTOPPING

PART 1 - GENERAL

1.01 WORK INCLUDES

A. Firestopping System.

1.02 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM E 84 – Surface Burning Characteristics of Building Material.

2. ASTM E 119 – Fire Tests of Building Construction and Materials.

3. ASTM E 814 – Fire Tests of Through-Penetration Fire Stops.

4. ASTM E 1399 – Cyclic Movement and Measuring the Minimum and Maximum Joint Widths of Architectural Joint System.

5. ASTM E 1966 – Fire Resistive Joint Systems.

B. FM Global (FM)

1. FM P 7825a – Approval Guide Fire Protection.

2. FM Standard 4991 – Approval of Firestop Contractors.

I. Underwriters Laboratories (UL)

1. UL 723 – Test for Surface Burning Characteristics of Building Materials.

2. UL 1479 – Fire Tests of Through-Penetration Firestops.

3. UL 2079 – Tests for Fire Resistance of Building Joint Systems.

4. UL Fire Resist Dir – Fire Resistance Directory.

1.03 SUBMITTALS

A. Shop Drawings

1. Detail drawings including manufacturer’s descriptive data, typical details conforming to UL Fire Resist Dir or other details certified by another

nationally recognized testing laboratory, installation instructions or UL listing details for a firestopping assembly in lieu of fire-test data or report. For those firestop applications for which no UL tested system is available through a manufacturer, a manufacturer's engineering judgment, derived from similar UL system designs or other tests, shall be submitted for review and approval prior to installation. Submittal shall indicate the firestopping material to be provided for each type of application. When more than a total of 5 penetrations and/or construction joints are to receive firestopping, provide drawings that indicate location, ratings, and type of application.

B. Certificates

1. Certificates attesting that firestopping material complies with the specified requirements. In lieu of certificates, drawings showing UL classified materials as part of a tested assembly may be provided. Drawings showing evidence of testing by an alternate nationally recognized independent laboratory may be substituted.

C. Installer Qualifications

1. Documentation of training and experience.

D. Inspection

1. Manufacturer's representative certification stating that firestopping work has been inspected and found to be applied according to the manufacturer's recommendations and the specified requirements.

1.04 GENERAL REQUIREMENTS

A. Firestopping shall consist of furnishing and installing tested and listed firestop systems, combination of materials, or devices to form an effective barrier against the spread of flame, smoke and gases, and maintain the integrity of fire resistance rated walls, partitions, floors, and ceiling-floor assemblies, including through-penetrations and construction joints and gaps. Through-penetrations including the annular space around pipes, tubes, conduit, wires, cables and vents. Construction joints include those used to accommodate expansion, contraction, wind or seismic movement; firestopping material shall not interfere with the required movement of the joint. Gaps requiring firestopping include gaps between the curtain wall and the floor slab and between the top of the fire-rated walls and he roof or floor deck above.

1.05 DELIVERY AND STORAGE

A. Materials shall be delivered in the original unopened packages or containers showing name of the manufacturer and the brand name. Materials shall be stored off the ground and shall be protected from damage and exposure to elements. Damaged or deteriorated materials shall be removed from the site.

1.06 INSTALLER QUALIFICATIONS

A. The Contractor shall engage an experienced Installer who is:

1. FM Research approved in accordance with FM Standard 4991, or

2. Certified, licensed, or otherwise qualified by the firestopping manufacturer as having the necessary staff, training, and a minimum of 3 years experience in the installation of manufacturer's products per specified requirements. A manufacturer's willingness to sell its firestopping products to the Contractor or to an installer engaged by the Contractor does not in itself confer qualifications on the buyer. The Installer shall have been trained by a direct representative of the manufacturer, not distributor or agent, in the proper selection and installation procedures.

1.07 COORDINATION

A. The specified work shall be coordinated with other trades. Firestopping materials, at penetrations of pipes and ducts, shall be applied prior to insulating, unless insulation meets requirements specified for firestopping. Firestopping materials at building joints and construction gaps shall be applied prior to completion of enclosing walls or assemblies. Cast-in-place firestop devices shall be located and installed in place before concrete placement. Pipe, conduit or cable bundles shall be installed through cast-in-place device after concrete placement but before area is concealed or made inaccessible.

PART 2 - PRODUCTS

2.01 FIRESTOPPING MATERIALS

A. General

1. Firestopping materials shall consist of commercially manufactured, asbestos-free, containing no water soluble intumescent material,

noncombustible products FM P 7825a approved for use with applicable construction and penetrating items.

B. Fire Hazard Classification

1. Material shall have a flame spread of 25 of less, and a smoke developed rating of 50 or less, when tested in accordance with ASTM E 84 or UL 723. Material shall be an approved firestopping material as listed in UL Fire Resist Dir or by a nationally recognized testing laboratory.

C. Toxicity

1. Material shall be nontoxic to humans at all stages of application or during fire conditions.

D. Fire Resistance Rating

1. Firestop systems shall be UL Fire Resist Dir listed or FM P 7825a approved with "F" rating at least equal o fire-rating of fire wall or floor in which penetrated openings are to be protected, except that "F" rating may be 3 hours in through-penetrations of 4 hour fire rated wall or floor. Firestop systems shall also have "T" rating where required.

a. Through-Penetrations: Firestopping materials for through-penetrations, as described in paragraph General Requirements, shall provide "F" and "T" fire resistance ratings in accordance with ASTM E 814 or UL 1479. Fire resistance ratings shall be as follows:

(1) Penetrations of Fire Resistance Rated Walls and Partitions: F Rating in accordance with design requirements. Rating of wall or partition being penetrated.

(2) Penetrations of Fire Resistance Rated Floors, Floor-Ceiling Assemblies and the ceiling membrane of Roof-Ceiling Assemblies: F Rating and T Rating in accordance with design requirements.

b. Construction Joints and Gaps: Fire resistance ratings of construction joints, and gaps such as those between floor slabs or roof decks and curtain walls shall be the same as the construction in which they occur. Construction joints and gaps shall be

provided with firestopping materials and systems that have been tested per ASTM E 119, ASTM E 1966 or UL 2079 to meet the required fire resistance rating. Systems installed at construction joints shall meet the cycling requirements of ASTM E 1399 or UL 2079.

PART 3 - EXECUTION

3.01 PREPARATION

A. Areas to receive firestopping shall be free of dirt, grease, oil, or loose materials which may affect the fitting of fire resistance of the firestopping system. For cast-in-place firestop devices, formwork or metal deck to receive device prior to concrete placement shall be sound and capable of supporting device. Surfaces shall be prepared as recommended by the manufacturer.

3.02 INSTALLATION

A. General

1. Firestopping material shall completely fill void spaces regardless of geometric configuration, subject to tolerance established by the manufacturer. Firestopping systems for filling floor voids 4 inches or more in any direction shall be capable of supporting the same load as the floor is designed to support or shall be protected by a permanent barrier to prevent loading or traffic in the firestopped area. Firestopping shall be installed in accordance with manufacturer's written instructions. Tested and listed firestop systems shall be provided in the following locations, except in floor slabs on grade:

a. Penetrations of duct, conduit, tubing, cable and pipe through floors and through fire-resistance rated walls, partitions, and ceiling-floor assemblies.

b. Penetrations of vertical shafts such as pipe chases, elevator shafts, and utility chutes.

c. Gaps at the intersection of floor slabs and curtain walls, including inside of hollow curtain walls at the floor slab.

d. Gaps at perimeter of fire-resistance rated walls and partitions, such as between the top of the walls and the bottom of roof decks.

e. Construction joints in floors and fire rated walls and partitions.

f. Other locations where required to maintain fire resistance rating of the construction.

B. Insulated Pipes and Ducts

1. Thermal insulation shall be cut and removed where pipes or ducts pass through firestopping, unless insulation meets requirements specified for firestopping. Thermal insulation shall be replaced with a material having equal thermal insulating and firestopping characteristics.

C. Fire Dampers

1. Fire dampers shall be installed and firestopped in accordance with design requirements.

D. Data and Communication Cabling

1. Cabling for data and communication applications shall be sealed with re-enterable firestopping products that do not cure over time. Firestopping shall be modular devices, containing built-in self-sealing intumescent inserts. Firestopping devices shall allow for cable moves, add or changes without the need to remove or replace any firestop materials.

3.03 INSPECTION

A. For all projects the firestopped areas shall not be covered or enclosed until inspection is complete and approved by the manufacturer's technical representative. The manufacturer's representative shall inspect the applications initially to ensure adequate preparations clean surfaces suitable for application, etc. and periodically during the work to assure that the completed work has been accomplished according to the manufacturer's written instructions and the specified requirements. The Contractor shall submit written reports indicating locations of and types of penetrations and types of firestopping used at each location; type shall be recorded by UL listed printed numbers.

END OF SECTION

SECTION 07920
JOINT SEALANTS

PART 1 - GENERAL

1.01 WORK INCLUDES

A. Sealant

B. Primers

C. Bond Breakers

D. Backstops

1.02 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM C 509 – Elastomeric Cellular Preformed Gasket and Sealing Material.

2. ASTM C 570 – Oil and Resin Base Caulking Compound for Building Construction.

3. ASTM C 734 – Low-Temperature Flexibility of Latex Sealants after Artificial Weathering.

4. ASTM C 834 – Latex Sealants.

5. ASTM C 919 – Use of Sealants in Acoustical Applications.

6. ASTM C 920 – Elastomeric Joint Sealants.

7. ASTM D 217 – Cone Penetration of Lubricating Grease.

8 ASTM D 1056 – Flexible Cellular Materials - Sponge or Expanded Rubber.

9. ASTM D 1667 – Flexible Cellular Materials - Vinyl Chloride Polymers and Copolymers (Closed-Cell Foam).

10. ASTM E 84 – Surface Burning Characteristics of Building Materials.

1.03 SUBMITTALS

A. Product Data

1. Submit manufacturer's descriptive data including storage requirements, shelf life, curing time, instructions for mixing and application, and primer data, if required. A copy of the Material Safety Data Sheet shall be provided for sealants, primers, bond breakers, and backstops.

B. Certificates

1. Certificates of compliance stating that the sealants conform to the specified requirements.

1.04 ENVIRONMENTAL CONDITIONS

A. The ambient temperature shall be within the limits of 40 and 90 degrees F when sealant is applied.

1.05 DELIVERY AND STORAGE

A. Deliver material to the job site in unopened manufacturer's external shipping containers, with brand names, date of manufacture, and material designation clearly marked thereon. Elastomeric sealant containers shall be labeled to identify type, class, grade, and use. Carefully handle, and store materials to prevent inclusion of foreign materials or subjection to sustained temperatures exceeding 90 degrees F or less than 0 degrees F.

PART 2 - PRODUCTS

2.01 SEALANTS

A. Provide sealant that has been tested and found suitable for the substrates to which it will be applied.

1. ASTM C 834 or ASTM C 920 based on design requirements, Type S or M, Grade NS, Class 12.5,. Locations of sealant shall be as follows:

Location

a. Small voids between walls or partitions and adjacent lockers, casework, shelving, door frames, built-in or surface-mounted equipment and fixtures, and similar items.

b. Perimeter of frames at doors, windows, and access panels which adjoin exposed interior concrete and masonry surfaces.

c. Joints of interior masonry walls and partitions which adjoin columns, pilasters, concrete walls, and exterior walls unless otherwise detailed.

d. Joints between edge members for acoustical tile and adjoining vertical surfaces.

e. Interior locations. not otherwise indicated or specified, where small voids exist between materials specified to be painted.

f. Joints between bathtubs and ceramic tile; joints between shower receptors and ceramic tile; joints formed where nonplaner tile surfaces meet.

g. Joints formed between tile floors and tile base cove; joints between tile and dissimilar materials; joints occurring where substrates change.

h. Behind escutcheon plates at valve pipe penetrations and showerheads in showers.

B. Exterior Sealant

1. For joints in vertical surfaces, provide ASTM C 920, Type S or M, Grade NS, Class 25, use NT. For joints in horizontal surfaces, provide ASTM C 920, Type S or M, Grade P, Class 25, use T. Locations of sealant shall be as follows:

Location

a. Joints and recesses formed where frames and subsills of windows, doors, louvers, and vents adjoin masonry,

concrete, or metal frames. Use sealant at both exterior and interior surfaces of exterior wall penetrations.

b. Joints between new and existing exterior masonry walls.

c. Masonry joints where shelf angles occur.

d. Joints in wash surfaces of stonework.

e. Expansion and control joints.

f. Interior face of expansion joints in exterior concrete or masonry walls where metal expansion joint covers are not required.

g. Voids where items pass trough exterior walls.

h. Metal reglets, where flashing is inserted into masonry joints, and where flashing is penetrated by; coping dowels.

i. Metal-to-metal joints where sealant is indicated or specified.

j. Joints between ends of gravel stops, fascias, copings, and adjacent walls.

C. Floor Joint Sealant

1. ASTM C 920, Type S or M, Grade P, Class 25, use T. Locations and colors of sealant shall be as follows:

Location

a. Seats of metal thresholds for exterior doors.

b. Control and expansion joints in floors, slabs, ceramic tile, and walkways.

2. Acoustical Sealant (For non moving joints)

a. Rubber or polymer-based acoustical sealant conforming to ASTM C 919 shall have a flame spread of 25 or less and a smoke developed rating of 50 or less when tested in accordance with ASTM E 84. Acoustical sealant shall have a consistency of 250 to 310 when tested in accordance with

ASTM D 217, and shall remain flexible and adhesive after 500 hours of accelerated weathering as specified in ASTM C 734, and shall be non-staining.

3. Preformed Sealant

a. Preformed sealant shall be polybutylene or isoprene-butylene based pressure sensitive weather resistant tape or bead sealant capable of sealing out moisture, air and dust when installed as recommended by the manufacturer. At temperatures from minus 30 to plus 160 degrees F, the sealant shall be non-bleeding and shall have no loss of adhesion.

Tape sealant: cross-section dimensions shall in in accordance with design requirement.

Bead sealant: cross-section dimensions shall be in accordance with design requirements.

b. Foam strip shall be polyurethane foam; cross-section dimensions shall be in accordance with design requirements. Foam strip shall be capable of sealing our moisture, air, and dust when installed and compressed as recommended by the manufacturer. Service temperature shall be minus 40 to plus 275 degrees F. Untreated strips shall be furnished with adhesive to hold them in place. Adhesive shall not stain or bleed into waterproofing or impregnated with asphalt.

2.02 PRIMERS

A. Provide a non-staining, quick-drying type and consistency recommended by the sealant manufacturer for the particular application.

2.03 BOND BREAKERS

A. Provide the type and consistency recommended by the sealant manufacturer to prevent adhesion of the sealant to backing or to bottom of the joint.

2.04 BACKSTOPS

A. Provide glass fiber roving or neoprene, butyl, polyurethane, or polyethylene foams free from oil or other staining element as recommended by sealant manufacturer. Backing shall be 25 to 33 percent oversize for closed cell and 40 to 50 percent oversize for open cell material, unless otherwise indicated. Backstop material shall be compatible with sealant. Do not use oakum and other types of absorptive materials as backstops.

1. Rubber.

a. Cellular rubber sponge backing shall be ASTM D 1056, Type 1, open cell, or Type 2, closed cell, Class A, B, or D. Grade and cross section in accordance with design requirements.

2. Polyvinyl Chloride.

a. Polyvinyl chloride (PVC) backing shall be ASTM D 1667, Grade and cross section in accordance with design requirements.

3. Synthetic Rubber.

a. Synthetic rubber backing shall be ASTM C 509, option I or II, Type I or II preformed rods or tubes.

4. Neoprene.

a. Neoprene backing shall be ASTM D 1056, closed cell expanded neoprene cord Type 2, Class C, Grade 2C2, open cell neoprene sponge, Type 1, Class C, Grade 1 C3.

2.05 CAULKING

A. Oil and resin based caulking shall be ASTM C 570, in accordance with design requirements.

2.06 CLEANING SOLVENTS

A. Provide types recommended by the sealant manufacturer, except for aluminum and bronze surfaces that will be in contact with sealant.

PART 3 - EXECUTION

3.01 SURFACE PREPARATION

A. Surfaces shall be clean, dry to the touch, and free from dirt frost, moisture, grease, oil, wax, lacquer, paint, or other foreign matter that would tend to destroy or impair adhesion. Oil and grease shall be removed with solvent and surfaces shall be wiped dry with clean cloths. When resealing an existing joint, remove existing calk or sealant prior to applying new sealant. For surface types not listed below, the sealant manufacturer shall be contacted for specific recommendations.

1. Steel Surfaces.

a. Remove loose mill scale by sandblasting or, if sandblasting is impractical or would damage finish work, clean by scraping and wire brushing. Remove protective coatings by sandblasting or using a residue-free solvent.

2. Aluminum or Bronze Surfaces.

a. Remove remporary protective coatings from surfaces that will be in contact with sealant. When masking tape is used as a protective coating, remove tape and any residual adhesive just prior to sealant application. For removing protective coatings and final cleaning, use non-staining solvents recommended by the manufacturer of the items containing aluminum or bronze surfaces.

3. Concrete and Masonry Surfaces.

a. Where surfaces have been treated with curing compounds, oil, or other such materials, the materials shall be removed by; sandblasting or wire brushing. Laitance, efflorescence and loose mortar shall be removed from the joint cavity.

4. Wood Surfaces.

a. Wood surfaces to be in contact with sealants shall be free of splinters and sawdust or other loose particles.

3.02 SEALANT PREPARATION

A. Do not add liquids, solvents, or powders to the sealant. Mix multi-component elastomeric sealants in accordance with manufactlurer's instructions.

3.03 APPLICATION

A. Joint Width-To-Depth Ratings

1. Acceptable Ratios:

JOINT WIDTH	JOINT DEPTH	
	Minimum	Maximum
For metal, glass, or other Nonporous surfaces:		
¼ inch (minimum)	¼ inch	¼ inch
over ¼ inch	½ of width	Equal to width
For wood, concrete, masonry, and stone		
¼ inch (minimum)	¼ inch	¼ inch
over ¼ inch to ½ inch	¼ inch	Equal to width
over ½ inch to 2 inches	½ inch	5/8 inch
over 2 inches	(As recommended by sealant manufacturer)	

2. Unacceptable Ratios: Where joints of acceptable width-to-depth ratios have not been provided, clean out joints to acceptable depths and grind or cut to acceptable widths without damage to the adjoining work. Grinding shall not be required on metal surfaces.

B. Masking Tape

1. Masking tape shall be placed on the finish surface on one or both sides of a joint cavity to protect adjacent finish surfaces from primer or sealant smears. Masking tape shall be removed within 10 minutes after joint has been filled and tooled.

C. Backstops

1. Install backstops dry and free of tears or holes. Tightly pack the back or bottom of joint cavities with backstop material to provide a joint of the depth specified. Install backstops in the following locations:

a. Where indicated.

b. Where backstop is not indicated but joint cavities exceed the acceptable maximum depths specified in paragraph entitled, "Joint Width-to-Depth Ratios.

D. Primer

1. Immediately prior to application of the sealant, clean out loose particles from joints. Where recommended by sealant manufacturer, apply primer to joints in concrete masonry units, wood, and other porous surfaces in accordance with sealant manufacturer's instructions. Do not apply primer to exposed finish surfaces.

E. Bond Breaker

1. Provide bond breakers to the back or bottom of joint cavities, as recommended by the sealant manufacturer for each type of joint and sealant used, to prevent sealant from adhering to these surfaces. Carefully apply the bond breaker to avoid contamination of adjoining surfaces or breaking bond with surfaces other than those covered by the bond breaker.

F. Sealants

1. Provide a sealant compatible with the materials to which it is applied. Do not use a sealant that has exceeded shelf life or has jelled and can not be discharged in a continuous flow from the gun. Apply the sealant in accordance with the manufacturer's instructions with a gun having a nozzle that fits the joint width. Force sealant into joints to fill the joints solidly without air pockets. Tool sealant after application to ensure adhesion. Sealant shall be uniformly smooth and free of wrinkles. Upon completion of sealant application, roughen partially filled or unfilled joints, apply sealant, and tool smooth as specified. Sealer shall be applied over the sealant when and as specified by the sealant manufacturer.

3.04 PROTECTION AND CLEANING

A. Protection

1. Protect areas adjacent to joints from sealant smears. Masking tape may be used for this purpose if removed 5 to 10 minutes after the joint is filled.

B. Final Cleaning

1. Upon completion of sealant application, remove remaining smears and stairs and leave the work in a clean and neat condition.

a. Masonry and Other Porous Surfaces: Immediately scrape off fresh sealant that has been smeared on masonry and rub clean with a solvent as recommended by the sealant manufacturer. Allow excess sealant to cure for 24 hours then remove by wire brushing or sanding.

b. Metal and Other Porous Surfaces: Remove excess sealant with a solvent-moistened cloth.

END OF SECTION

General Notes

1. Chemically curing sealants should not be used adjacent to or above membrane surfaces of asphaltic or bituminous materials. Use a sealant of similar material.

2. Rubber Backstops
- Class A is adequate for most applications.
- Class B is petroleum and fuel resistant.
- Class D is appropriate for extreme cold (-103 degrees F application with no petrochemical exposure.

3. Do not use open cell vinyl foam backstops for below grade moist applications.

4. When specifying Synthetic Rubber backstops
use Option I and Type I for most applications.
use Option II if flame is not required.
use Type II when ozone resistance is a requirement.

SECTION 08110
STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.01 GENERAL

A. Steel Doors

B. Steel Frames

1.02 REFERENCE STANDARDS

A. American National Standards Institute (ANSI)

B. American Society of Testing and Materials (ASTM)

1. ASTM A 153 – Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

2. ASTM A 366 – Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality.

3. ASTM A 510 – General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel.

4. ASTM A 569 – Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip.

5. ASTM A 591 – Steel Sheet, Electrolytic Zinc-Coated, for Light Coating Mass Applications.

6. ASTM A 620 – Steel, Sheet, Carbon, Cold-Rolled.

7. ASTM A 653 – Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed by the Hot-Dip Process.

C. National Fire Protection Association (NFPA)

D. Steel Door Institute (SDI)

1.03 QUALITY ASSURANCE

A. Comply with ANSI A 250.8, unless more stringent requirements are indicated.

B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Hot-Rolled Steel Sheets: ASTM A 569, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

B. Cold-Rolled Steel Sheets: ASTM A 366, Commercial Steel (CS), or ASTM A 620, Drawing Steel (DS), Type B; stretcher-leveled standard of flatness.

C. Metallic-Coated Steel Sheets: ASTM A 653, Commercial Steel (CS), Type B, with A40 zinc-iron-alloy (galvannealed) coating; stretcher-leveled standard of flatness.

D. Electrolytic Zinc-Coated Steel Sheets: ASTM A 591, Commercial Steel (CS), Class B coating; mill phosphatized; suitable for unexposed applications; stretcher-leveled standard of flatness where used for face sheets.

2.02 INTERIOR DOORS

A. Doors complying with requirements indicated below by referencing ANSI 250.8 for level and model and ANSI A250.4 for physical-endurance level:

1. Level 2 and Physical Performance Level B, Model 1.

2.03 EXTERIOR DOORS

A. Doors complying with requirements indicated below by referencing ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level:

1. Level 3 and Physical Performance Level A, Model 1.

2.04 FRAMES

A. Provide steel frames that comply with ANSI A250.8 and with steel sheet thickness as indicated for door level selected below:

1. For level 3 Steel Doors, 0.067 inch.

2. Door Silencers: Three silencers on single-door frames and two silencers on double-door frames.

3. Plaster Guards: Provide 0.016-inch thick, steel sheet plaster guards or mortar boxes to close off interior of openings.

4. Supports and Anchors: Not less than 0.042-inch thick, zinc-coated steel sheet.

5. Wall Anchors in Masonry Construction: 0.177-inch diameter, steel wire complying with ASTM A 510 may be used in place of steel sheet.

6. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where zinc-coated items are to be built into exterior walls, comply with ASTM A 153, Class C or D as applicable.

2.05 Fabricate steel door and frame units to comply with ANSI A250.8 and to be free from defects including warp and buckle. Where practical, fit and assemble units in manufacturer's plant.

A. Exterior Doors and Frames: Fabricate from metallic-coated steel sheet. Close top and bottom edges of doors flush.

B. Interior Door and Panel Faces: Fabricate exposed faces of doors and panels, including stiles and rails of non-flush units, from cold-rolled steel sheet.

C. Core Construction: Manufacturer's standard core construction that produces a door complying with SDI standards.

D. Door-Edge Profile: Square edge.

E. Tolerances: Comply with SDI 117.

F. Prepare doors and frames to receive hardware. Reinforce doors and frames to receive surface-applied hardware. Comply with applicable

requirements to ANSI A 250.6 and ANSI A115 Series specifications for door and frame preparation for hardware.

G. Fabricate frames with mitered or coped and continuously welded corners and seamless face joints. Provide temporary spreader bars.

H. Fabricate knock-down frames with mitered or coped corners, for field assembly.

I. Fabricate knock-down, drywall slip-on frames for in-place gypsum board partitions.

J. Provided non-removable glazing stops on outside of exterior doors and on secure side of interior doors for glass, louvers, and other panels in doors.

K. Provide screw-applied, removable, glazing stops on inside of glass, louvers, and other panels in doors.

2.06 Astragals: As required by NFPA 80 to provide fire ratings indicated.

2.07 Prime Finish: Manufacturer's standard, factory-applied coat or rust-inhibiting primer complying with ANSI A250.10 for acceptance criteria.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install doors and frames according to Shop Drawings and manufacturer's data.

1. Frames: Install steel frames for doors and other openings, of size and profile indicated.

a. Set masonry anchorage devices where required for securing frames to in-place concrete or masonry construction.

b. Provide at least three wall anchors per jamb. For openings 90 inches or more in height, install an additional anchor at hinge and strike jambs.

c. For in-place gypsum board partitions, install knock-down, drywall slip-on frames.

d. Install fire-rated frames according to NFPA 80.

e. Placing Frames: Comply with provisions in SDI 105, unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.

1) At existing concrete or masonry construction, set frames and secure in place with machine screws and masonry anchorage devices.

2) At fire-rated openings, install frames according to NFPA 80.

2. Doors: Install to comply with ANSI A250.8. Shim as necessary to comply with SDI 122 and ANSI/DHI A115.1G. Fit non-fire-rated doors accurately in their respective frames, with the following clearances:

a. Jambs and Head: 1/8 inch.
b. Meeting Edges, Pairs of Doors: ¼ inch.
c. Bottom: ¾ inch.

3. Fire-Rated Doors: Install within clearances specified in NFPA 80.

4. Smoke-Control Doors: Install according to NFPA 105.

3.02 ADJUSTING AND CLEANING

A. Prime-Coat Touchup: Sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.

B. Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.

END OF SECTION

General Notes

1. *Exterior door frame subject to abuse, and security doors should be provided with 14 ga. Frames (minimum).*

2. *Doors and frames exceeding 3"-0" in width and 7'-0" in height should be provided with four pair of hinges.*

SECTION 08210
WOOD DOORS

PART 1 - GENERAL

1.01 WORK INCLUDES

A. Interior Flush Doors

B. Fire Rated Doors

1.02 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM E 152 – Fire Testes of Door Assemblies.

B. National Fire Protection Association (NFPA)

1. NFPA 252 – Fire Tests of Door Assemblies.

2. NFPA 80 – Fire Doors and Fire Windows.

C. Underwriters Laboratories (UL)

1. UL 10 B – Fire Tests of Door Assemblies.

D. Window and Door Manufacturers Association (AWMA)

1. WDMA I. S. 1-A – Architectural Wood Flush Doors.

2. WDMA I.S. 4 – Water Repellent Preservative Non-Pressure Treatment for Millwork.

3. WDMA TM-5 – Split Resistance Test Method.

4. WDMA TM-7 – Cycle Slam Test Method.

5. WDMA TM-8 – Hinge Loading Test Method.

1.03 SUBMITTALS

A. Shop Drawings

1. Submit drawings of catalog data showing each type of door unit. Drawings and data shall indicate door type and construction, size, thickness, door louvers, and glazing.

B. Product Data

1. Submit detail specifications and instructions for installation, adjustments, cleaning, and maintenance.

C. Test reports

1. Submit split resistance test report for doors tested in accordance with WDMA TM-5, cycle-slam test report for doors tested in accordance with WDMA TM-7, and hinge loading resistance test report for doors tested in accordance with WDMA TM-8.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors to the site in an undamaged condition and protect against damage and dampness. Stack doors flat under cover. Support on blocking, a minimum of 4 inches thick, located at each end and at the midpoint of the door. Store doors in a well-ventilated building so that they will not be exposed to excessive moisture, heat, dryness, direct sunlight, or extreme changes of temperature and humidity. Do not store in a building under construction until concrete, masonry work, and plaster are dry. Replace defective or damaged doors with new ones.

1.05 WARRANTY

A. Warranty shall warrant doors free of defects as set forth in the door manufacturer's standard door warranty.

PART 2 - PRODUCTS

2.01 DOORS

A. Flush Doors

1. Flush doors shall conform to WDMA I.S. 1-A. Hollow core doors shall have lock blocks and one inch minimum thickness hinge stile. Stile edge bands of doors to receive natural finish shall be hardwood, compatible with face veneer. Stile edge bands of doors to be painted shall be mill option species. No visible finger joints will be accepted in stile edge bands. When used, locate finger-joints under hardware.

B. Fire Doors

1. Doors specified or indicated to have a fire resistance rating shall conform to the requirements of UL 10B, ASTM E 152, or NFPA 252 for the class of door indicated. Affix a permanent metal label with raised or incised markings indicating testing agency's name and approved hourly fire rating to hinge edge of each door.

2.02 ACCESSORIES

A. Door Louvers

1. Fabricate from wood and of sizes indicated. Louvers shall be of the manufacturer's standard design and shall transmit a minimum of 35 percent free air. Louvers shall be the slat or sightproof inverted vee slat type. Mount louvers in the door with flush wood moldings or wood lip moldings.

B. Additional Hardware Reinforcement

1. Provide glazed openings with the manufacturer's standard wood moldings except that moldings for doors to receive natural finish shall be of the same specie and color as the face veneers. Moldings for flush doors shall be lip type. Provide glazed openings in fire-rated doors with fire rated frames.

C. Additional Hardware Reinforcement

1. Provide fire rated doors with hardware reinforcement blocking. Size of lock blocks shall be as required to secure the hardware specified. Top, bottom and intermediate rail blocks shall measure 5 inches minimum by full core width. Reinforcement blocking shall be in compliance with the manufacturer's labeling requirements and shall not be mineral material similar to the core.

2.03 FABRICATION

A. Marking

1. Each door shall bear a stamp, brand, or other identifying mark indicating quality and construction of the door.

B. Quality and Construction

1. Identify the standard on which the construction of the door was based identify the standard under which preservative treatment was made.

C. Preservative Treatment

1. Exterior doors shall be water-repellent preservative treated and so marked at the plant in accordance with WDMA I.S. 4.

D. Pre-fitting

1. At the Contractor's option, doors may be provided factory pre-fit. Doors shall be sized and machined at the factory by the door manufacturer in accordance with the standards under which they are produced. The work shall include sizing, beveling edges, mortising, and drilling for hardware and providing necessary beaded openings for glass and louvers. Provide the door manufacturer with the necessary hardware samples, and frame and hardware schedules as required to coordinate the work.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General

1. Before installation, seal top and bottom edges of doors with the approved water-resistant sealer. Seal cuts made on the job immediately after cutting using approved water-resistant sealer. Fit, trim, and hang doors with a 1/16 inch minimum, 1/8 inch maximum clearance at sides and top, and 3/16 inch minimum, ¼ inch maximum clearance over thresholds. Provide 3/8 inch minimum, 7/16 inch maximum clearance at bottom where no threshold occurs. Bevel edges of doors at the rate of 1/8 inch in 2 inches. Door warp shall not exceed ¼ inch when measured in accordance with WDMA I.S. 1-A.

B. Fire Doors:

1. Install fire doors in accordance with NFPA 80. Do not paint over labels.

END OF SECTION

SECTION 08331
METAL ROLLING COUNTER DOORS

PART 1 - GENERAL

1.01 WORK INCLUDES

A. Rolling Counter Doors (Non-Rated)

B. Fire Rated Rolling Counter Doors

C. Manual and Power Operated Counter Doors

1.02 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM).

1. ASTM A 240 – Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels for General Applications.

2. ASTM A 653 – Specifications Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

3. ASTM B 209 – Aluminum and Aluminum-Alloy Sheet and Plate.

4. ASTM B 221 – Specifications for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

B. National Fire Protection Association (NFPA)

1. NFPA 80 – Fire Doors and Fire Windows.

1.03 SUBMITTALS

A. Shop Drawings

1. Submit drawings showing elevations of each door type, details of anchorage, details of construction, location and description of hardware, shape and thickness of materials, details of joints and connections, and details of guides and fittings. A schedule showing the location of each counter door shall be included with the drawing.

B. Product Data

1. Submit manufacturer's description data and catalog cuts and manufacturer's preprinted installation and cleaning instructions.

C. Operating and Maintenance Data

1. Submit maintenance instructions listing routine maintenance procedures, possible breakdowns and equipment as installed. The data shall include a complete list of parts and supplies, with current unit prices and source of supply, and a list of the parts recommended by the manufacturer to be replaced after 3 years of service.

1.04 GENERAL REQUIREMENTS

A. Rolling counter doors shall be of the type, size, and design indicated on the drawings, and shall be the standard product of a manufacturer regularly engaged in the production of rolling counter doors. Each door shall be provided with a permanent label showing the manufacturer's name and address and the model number of the door.

1.05 DELIVERY AND STORAGE

A. Rolling counter doors shall be delivered to the jobsite wrapped in a protective covering with the brands and names clearly marked thereon. Rolling counter doors shall be stored in accordance with the manufacturer's instruction in a dry location that is adequately ventilated and free from dust, water, or other contaminants, and in a manner that permits easy access for inspecting and handling. Doors shall be handled carefully to prevent damage. Damaged items that cannot be restored to like-new condition shall be replaced.

PART 2 - PRODUCTS

2.01 BASIC COMPONENTS

A. Curtains

1. The curtain shall be fabricated of extruded aluminum slats conforming to ASTM B 221, Alloy 6063, 22 gauge Type 304 stainless steel slats conforming to ASTM A 240, Type 304 or Type 430, gauge galvanized steel slats conforming to ASTM A 653, coating designation G60 or G90 in

accordance with design requirements. Thickness of slat material shall be as required by width of opening or as required by specified fire-rating.

2. Slats shall be approximately 1-1/4 – 1-1/2 inch wide with a depth of crown of ½ inch. Alternate slats shall be fitted with end locks to maintain curtain alignment. Bottom of curtain shall be provided with angle or tubular bar reinforcement matching the curtain, and fitted with a resilient bottom seal.

B. Jamb Guides

1. Guides shall be of 1/8 inch minimum thickness extruded aluminum conforming to ASTM B 221, Alloy 6063, and shall be fitted with neoprene silencers or replaceable heavy nap striping to eliminate noise and dust infiltration 13 gauge minimum thickness stainless steel conforming to Type 304 or Type 430 in accordance with design requirements, 13 gauge minimum thickness galvanized steel angles conforming to ASTM A 653 Coating Designation G60 or G90 in accordance with design requirements.

C. Counterbalance Shaft Assembly

1. The curtain shall be coiled around a steel tube of sufficient thickness and diameter to prevent deflection exceeding 0.03 inch per foot. The barrel shall contain oil tempered helical steel torsion springs capable of sufficient torque to counterbalance the weight of the curtain. Springs shall be calculated to provide a minimum of 7,500 operating cycles one complete cycle of door operation will begin with the door in the closed position, move to the full open position and return to the closed position.

D. Brackets

1. Brackets shall be a minimum 12 gauge thickness steel if flat plate, or 16 gauge thickness if there are a minimum of 3 returns ¾ inch width.

E. Hood

1. The hood shall be of 0.040 inch minimum thickness aluminum sheet conforming to ASTM B 209, Alloy 5005, 24 gauge stainless steel conforming to ASTM A 240, Type 304 or Type 430 in accordance with design requirements, 24 gauge galvanized steel conforming to ASTM A 653, Coating Designation G60 or G90 in accordance with design requirements.

F. Locks

1. The curtain shall be locked at both sides of bottom bar by a chrome-plated cylinder lock keyed into the building keying system.

2.02 ROLLING COUNTER DOOR (NON-RATED)

A. Rolling counter doors shall conform to the requirements specified herein and shall be constructed of aluminum, stainless steel, or glanvanized curtains, guides and hood components.

2.03 FIRE-RATED ROLLING COUNTER DOOR

A. Fire-rated rolling counter doors shall be Class A, 3 hours; Class B, 1-1/2 hour; Class C, ¾ hour; of Class D ½ hour rated in accordance with design requirements and shall conform to the requirements specified and to NFPA 80 for the class indicated. Doors shall bear the labels of a recognized testing agency indicating the applicable fire resistance rating. The construction details necessary for labeled rolling counter doors shall take precedence over details indicated or specified herein. Door curtains, guides and hood shall be stainless steel galvanized steel. Fire-rated rolling counter doors shall be complete with hardware, accessories, and automatic closing device. Rolling counter doors in exit corridor walls shall be provided with perimeter smoke and draft control gasketing.

2.04 INTEGRAL FRAME ROLLING COUNTER DOOR (RATED OR NON-RATED)

A. Integral frame rolling counter door shall be aluminum, stainless steel, or galvanized steel. Class A; 3 Hour, Class B; 1-1/2 hour, Class C; ¾ hour, Class D; ½ hour in accordance with design requirements. Stainless steel, galvanized steel. Fire-rated doors shall conform to the requirements of NFPA 80 for agency indicating the applicable fire resistance rating. Jambs shall be formed to create guides for the curtain. Head and jambs shall be 16 gauge thickness. Counter shall be 14 gauge thickness. Rolling counter doors in exit corridor walls shall be provided with perimeter smoke and draft control gasketing.

2.05 OPERATION

A. Manual Operation

1. The curtain shall be operated by means of manual push-up with lift handles or continuous full width lift bar or manual crank with removable handle.

B. Power Operation

1. A high-starting torque, reversible type motor of sufficient power and torque output to move the door in either direction from any position at the required speed shall be furnished. Power operator shall have an emergency push-up operation, limit switch, three-button type control marked "OPEN".

2.06 AUTOMATIC CLOSING DEVICE

A. Fire-rated counter doors shall be equipped with an automatic closing device which shall operate upon activation of the building's fire alarm system, smoke alarm system, or heat detector system. Fire and smoke doors shall be easily reset by the facility user after they have been released by the detection system. Resetting the door shall not require the use of special tools.

B. Exposed parts of the counter door, including the curtain, bottom rail, guides, and hood shall be of uniform finish and appearance. Aluminum shall have a clear anodized finish. Stainless steel shall have a No. 4 finish. Steel galvanized coating shall have a prime coat and a baked-on or powder-coated Factory coated finish. All other steel parts shall be given a shop coat of primer paint standard with the manufacturer.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Doors shall be installed in accordance with approved detail drawings and manufacturer's instructions. Anchors and inserts for guides, brackets, hardware, and other accessories shall be accurately located. Upon completion, doors shall be from warp, twist, or distortion. Doors shall be lubricated, properly adjusted, and demonstrated to operate freely. Fire-door installation shall be in conformance with NFPA 80 for the class indicated and the manufacturer's instructions.

3.02 CLEANING

A. Aluminum and stainless steel doors shall be cleaned in accordance with manufacturer's instructions.

3.03 TESTS

A. The fire doors shall be drop tested in accordance with NFPA 80 to show proper operation and full automatic closure and shall be reset in accordance with the manufacturer's instructions

END OF SECTION

General Notes

1. Aluminum and stainless steel should not be used for high frequency application.

2. Fire rated doors shall be manufactured of steel.

3. Coating G60 is generally adequate for application. Specify G90 in areas of high humidity and marine climates.

4. Activation of the automatic closing device on fire rated counter doors shall be activated by the fire alarm system and/or a smoke/heat detector system. Fusible link devices are not acceptable for life safety consideration.

SECTION 08361
SECTIONAL OVERHEAD DOORS

PART 1 - GENERAL

1.01 WORK INCLUDES

A. Sectional Overhead Doors

B. Overhead Door Hardware

C. Electric Operators

1.02 REFERENCE STANDARDS

A. Aluminum Association (AA)

B. American Society for Testing and Materials (ASTM).

1. ASTM A 36 – Carbon Structural Steel.

2. ASTM A 123 – Zinc (Hot-Dip Galvanized) Coating on Iron and Steel Products.

3. ASTM A 227 – Steel Wire, Cold-Drawn for Mechanical Springs.

4. ASTM A 229 – Steel Wire, Oil-Tempered for Mechanical Springs.

5. ASTM A 653 – Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

6. ASTM B 209 – Aluminum and Aluminum-Alloy Sheet and Plate.

7. ASTM B 221 – Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

8. ASTM E 330 – Specifications for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

C. National Association of Architectural Metal Manufacturers (NAAMM)

1. NAAMM AMP 500 – Metal Finishes Manual.

D. National Association of Garage Door Manufacturers (NAGDM)

1. NAGDM 102 – Sectional Overhead Type Doors.

E. National Electrical Manufacturers Association (NEMA)

1. NEMA ICS 1 – Industrial Control and Systems.

2. NEMA ICS 2 – Industrial Control and Systems Controllers, Contractors and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC.

3. NEMA ICS 6 – Industrial Control and Systems Enclosures.

4. NEMA MG 1 – Motors and Generators.

F. National Fire Protection Association (NFPA)

1. NFPA 70 – National Electrical Code.

1.03 SUBMITTALS

A. Shop Drawings

1. Show type, size, locations, metal gages including minimum metal decimal thickness, hardware provisions, installation details, and other details of construction. For electrically-operated doors, include supporting brackets for motors, location, type, and ratings or motors, switches, and safety devices.

B. Product Data

1. For electrically motor-operated doors, submit manufacturer's wiring diagrams for motor and controls.

C. Operating and Maintenance Data

1. Operations and Maintenance Data.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Protect doors and accessories from damage during delivery, storage, and handling. Clearly mark manufacturer's brand name. Store doors in dry locations

with adequate ventilation, free from dust and water. Storage shall permit easy access for inspection and handling. Remove damaged items and provide new.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Hard-Drawn Springwire: ASTM A 227.

B. Oil-Tempered Springwire: ASTM A 229.

C. Steel Sheet: ASTM A 653.

D. Steel Shapes: ASTM A 36.

E. Aluminum Extrusions: ASTM B 221, Alloy 6063-T5.

F. Aluminum Sheets and Strips: ASTM B 209, alloy and temper best suited for the purpose.

G. Glass: Fully tempered, clear float glass, ¼ inch thick.

1. Finish: Plain, in accordance with design requirements.

2.02 DOORS

A. General

1. NAGDM 102. Commercial doors. Metal doors shall be horizontal sections hinged together which operate in a system of tracks to completely close the door opening in the closed position and make the full width and height of the door opening available for use in the open position. Provide a permanent label on the door indicating the name and address of the manufacturer. Doors shall be of the standard lift type designed to slide up and back into a horizontal overhead position and requiring a maximum of 21 inches of headroom for 3 inch tracks, low headroom type designed to slide up and back into a horizontal overhead position and requiring a maximum of 12 inches of headroom for 3 inch tracks, high lift type designed to slide up and back into a combination vertical and horizontal position of vertical lift type designed to slide upward into a vertical position. Doors shall be operated by electric power with auxiliary hand chain operation.

2.03 DESIGN REQUIREMENTS

A. General

1. NAGDM 102 except that design wind load shall be in accordance with design requirements. Doors shall remain operable and undamaged after conclusion of tests conducted in accordance with ASTM E 330 using the design wind load.

2.04 FABRICATION

A. Tracks and Accessories

1. Tracks: Provide galvanized steel tracks not lighter than 12 gage for 3 inch tracks. Provide vertical tracks with continuous steel angle not lighter than 13 gage for installation to walls. Incline vertical track through use of adjustable brackets to obtain a weathertight closure at jambs. Reinforce horizontal track with galvanized steel angle; support from track ceiling construction with galvanized steel angle and cross bracing to provide a rigid installation.

2. Hardware: Provide hinges, brackets, rollers, locking devices, and other hardware required for complete installation. Roller brackets and hinges shall be 14 gage galvanized steel. Rollers shall have ball bearings and case-hardened races. Provide reinforcing on doors where roller hinges are connected. Provide a positive locking device and cylinder lock with two keys on manually operated doors.

3. Counterbalancing: Counterbalance doors with an oil-tempered, helical-wound torsional spring mounted on a steel shaft. Spring tension shall be adjustable; connect spring to doors with cable through cable drums. Cable safety factor shall be at lest 7 to 1.

B. Aluminum Panel Overhead Doors

1. Door sections shall be of panel construction with extruded aluminum stiles and rails with aluminum and glass panels. Stiles and rails shall have a minimum wall thickness of 0.060 inch. Meeting rails shall have interlocking joints to ensure a weathertight closure and alignment for full width of door. Sections shall be of the height indicated or the manufacturer's standard, but the height of an intermediate section shall not exceed 24 inches, and shall be of equal size. Aluminum shall be not less

than 0.040 inch in thickness. Install panel using a continuous vinyl gasket and snap-in type of aluminum of vinyl glazing bead.

2.05 MANUAL OPERATORS

A. Pushup Operators: Provide lifting handles on both sides of door. The force required to operate the door shall not exceed 25 pound. Provide pulldown straps or ropes at bottom of doors over 7 feet high.

B. Chain Hoist Operators: Provide a galvanized, endless chain operating over a sprocket. Extend chain to within 4 feet of the floor and mount on inside of building. Obtain reduction by use of roller chain and sprocket drive or gearing. Provide chain cleat and pin for securing operator chain. Hoist shall allow for future installation of power operators. The force required to operate the door shall not exceed 35 pounds.

C. Electric Operators

1. Operator Features

a. Provide operators of the drawbar type or side mount type as recommended by the manufacturer. Operators shall include electric motor, machine-cut reduction gears, steel chain and sprockets, magnetic brake, brackets, pushbutton controls, limit switches, magnetic reversing contactor, a manual chain hoist operator for emergency use, and other accessories necessary for operation. Design electric operator so motor may be removed without disturbing the limit switch timing and without affecting the manual operator. Provide the operator with slipping clutch coupling to prevent stalling the motor. The emergency manual operator shall be clutch controlled so that it may be engaged and disengaged from the floor; operation shall not affect limit switch timing. The manual operator is not required if door can be manual-pushup operated with a force not to exceed 25 pounds. Provide an electrical or mechanical device that disconnects the motor from the operating mechanism when the manual operator is engaged.

2. Motors

a. NEMA MG 1, high-starting torque, reversible type with sufficient horsepower and torque output to move the door in either direction from any position. Motor shall produce a door travel speed of not

less than two-thirds foot or more than one foot per second without exceeding the rated capacity. Motors shall be operated on current of the characteristics indicated at not more than 3,600 rpm. Single-phase motors shall not have commutation or more than one starting contact. Motor enclosures shall be drip-proof type or NEMA TENV type.

3. Controls

a. Each door motor shall have an enclosed, across-the-line type, magnetic reversing contactor, thermal overload and undervoltage protection, solenoid-operated brake, limit switches, and control switches. Locate control switches at least 5 feet above the floor so the operator will have complete visibility of the door at all times. Control equipment shall conform to NEMA ICS 1 and NEMA ICS 2. Control enclosures shall be NEMA ICS 6, Type 12 or Type 4, except that contactor enclosures may be Type 1. Each control switch station shall be of the three-button type with buttons marked "OPEN," "close," and "STOP." The "OPEN" and "STOP" buttons shall require only momentary pressure to operate. The "CLOSE" button shall require constant pressure to maintain the closing motion of the door. If the door is in motion and the "STOP" button is pressed or the "CLOSE" button release, the door shall stop instantly and remain in the stop position; from the stop position, the door may be operated in either direction by the "OPEN" or "CLOSE" button. Pushbuttons shall be full-guarded to prevent accidental operation. Provide limit switches to automatically stop doors at the fully open and closed positions. Limit switch positions shall be readily adjustable.

4. Safety Device

1. Provide a pneumatic or electric type safety device on the bottom edge of electrically-operated doors. The device shall immediately stop and reverse the door movement during the closing travel upon contact with an obstruction in the door opening or open failure of any component of the control system. The door-closing circuit shall be automatically locked out and the door shall be operable manually until the failure or damage has been corrected. Do not use the safety device as a limit switch.

5. Control Transformers.

    1. NEMA ST 20. Provide transformers in power circuits as necessary to reduce the voltage on the control circuits to 120 volts or less.

6. Electrical Components.

    1. NFPA 70. Furnish manual or automatic control and safety devices, including extra flexible Type SO cable and spring-loaded automatic take-up reel or equivalent device, as required for operation of the doors. Conduit, wiring, and mounting of control in accordance with design requirements.

D. WEATHER SEALS AND SAFETY DEVICE

1. Provide exterior doors with weatherproof joints between sections by means of tongue-and-groove joints, rabbetted joints, shiplap joints, or wool pile, vinyl or rubber weatherstripping; a rubber, wool pile, or vinyl, adjustable weatherstrip at the top and jambs; and a compressible neoprene, rubber, wool pile, or vinyl weather seal attached to the bottom of the door. The bottom seal shall be combination compressible weather seal and safety device for stopping and reversing door movement.

E. FINISHES

Conceal ferrous metal surfaces and tracks shall be hot-dip galvanized. Other ferrous metal surfaces, except rollers and lock components, shall be hot-dip galvanized and shop primed.

1. Galvanized and Shop Primed: Surfaces specified shall have a zinc coating, a phosphate treatment, and a shop prime coat of rust-inhibitive paint. The galvanized coating shall conform to ASTM A 123, coating designation G60, for steel sheets, and ASTM A 123 for assembled steel products. The weight of coatings for assembled products shall be as designated in Table I of ASTM A 123 for the class of material to be coated. The prime coat shall be a type especially developed for materials treated by phosphates and adapted to application be dipping or spraying. Repair damaged zinc-coated surfaces with galvanized repair paint and spot primer. At the Contractor's option, a two-part system including bonderizing, baked-on epoxy primer, and baked-on enamel topcoat may be applied in lieu of prime coat specified.

2. Aluminum: Surfaces shall receive a clear anodized finish, AA-M10-C22-A41, in accordance with NAAMM AMP 500. Exposed surfaces shall receive a pretreatment and a baked-on enamel finish as standard with the manufacturer.

PART 3 - EXECUTION

3.01 INSTALLATION

A. NFPA 70. Install doors in accordance with approved shop drawings and manufacturer's instructions. Upon completion, doors shall be weathertight and free from warp, twist, or distortion. Lubricate and adjust doors to operate freely.

3.02 ELECTRICAL WORK

A. NFPA 70. Conduit, wiring, and mounting of controls shall be in accordance with design requirements.

3.03 TESTING

A. After installation is complete, operate doors to demonstrate.

END OF SECTION

General Notes

1. One glazed panel located on the operator side of the door is recommended.

SECTION 08400
ENTRANCES AND STOREFRONTS

PART 1 – GENERAL

1.01 WORK INCLUDES

A Doors and Frames

B. Glass

C. Anchors and Fasteners

1.02 REFERENCE STANDARDS

A. Aluminum Association (AA).

B. American Architectural Manufacturer's Association (AAMA).

C. American Society for Testing and Materials (ASTM).

1. ASTM B 209 – Aluminum and Aluminum-Alloy Sheet and Plate.

2. ASTM B 221 – Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

3. ASTM C 236 – Test Method for Steady-State Thermal Performance of Building Assemblies by Means of a Guarded Hot Box.

4. ASTM E 283 – Test Method for Determining the Range of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

5. ASTM E 331 – Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

C. American Welding Society (AWS).

1. AWS D1.2 - Structural Welding Code - Aluminum.

1.03 SUBMITTALS

A. Shop Drawings: Show details of fabrication and installation, including plans, elevations, sections, details of components, provisions for expansion and contraction, and attachments to other work.

B. Samples for Verification: Of each type of exposed finish required in manufacturer's standard sizes. Where finishes involve normal color and texture variations, include Sample sets showing the full range of variations expected.

C. Product Test Reports: Based on evaluation of tests performed by manufacturer and witnessed by a qualified independent testing agency, indicate compliance of entrance and storefront systems with requirements based on comprehensive testing of current systems.

D. Structural Calculations: Provide calculations prepared by an engineer licensed to practice in the State of Alaska.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer to perform work of this Section who has specialized in installing entrance and storefront systems similar to those required for this Project and who is acceptable to manufacturer.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of entrance and storefront systems and are based on the specific systems indicated. Other manufacturer's systems with equal performance characteristics may be considered.

C. Welding Standards: Comply with applicable provisions of AWS D1.2, "Structural Welding Code-Aluminum."

PART 2 - PRODUCTS

2.01 GENERAL CHARACTERISTICS

A. Section Includes: Exterior aluminum doors, frames, and window walls, including glazing.

B. References and Quality Control: Assembly and installation shall be in accordance with the written instruction of the manufacturers.

2.02 PERFORMANCE CHARACTERISTICS

A. Structural Performance: Shapes and thicknesses of framing member shall be sufficient to withstand the design wind loads of the geographical location with a maximum deflection of 1/175 times the length of the member and with a minimum safety factor of 1.65. Glazing beads, moldings, and trim shall be of not less than .050 inch nominal thickness.

B. Air Infiltration: Maximum infiltration shall not exceed 0.06 cfm/psf of fixed area at a test pressure of 6.24 pounds psf in accordance with ASTM E283.

C. Water Infiltration: Test in accordance with ASTM E331. No water penetration at a test pressure of 10 pounds psf.

D. Thermal Performance: Test in accordance with ASTM C236 and AAMA 1502.7. The assembly shall have maximum U Value of 0.40 and a minimum CFR of 67.

E. Life Expectance: The system shall have a minimum useful life of 40 years.

2.03 DESIGN CHARACTERISTICS

A. Glass

1. Clear Float Glass: Type I, Class I, Quality 3-1/4 inch thickness.

2. Heat Absorbing Glass: Clean Cut, Type I, Class II, Color as selected, thickness as selected.

3. Insulating Glass: Banded, Class A, encased in stainless steel frame.

B. Doors and Frames

1. Aluminum Doors and Frames: Alloy 6063-T5 for extrusions (ASTM B221) and aluminum sheets and strips (ASTM B209).

2. Anchors: Stainless Steel on hot-dipped galvanized steel.

3. Fasteners: Hard aluminum or stainless steel.

C. Fabrication

1. Aluminum Frames: Mill joints in frame members to a hairline fit, reinforce, and secure mechanically. Use countersunk stainless steel. Phillips screws a maximum 12 inches o.c. for exposed fastenings. Provide removable glass stops and glazing beads for fixed glass.

2. Aluminum Doors: Not less than 1-3/4 inches thick. Minimum wall thickness of 0.125 inch.

3. Welding and Fastening: Locate welds on unexposed surfaces where possible. Dress welds smoothly on exposed structures.

4. Anchors: Locate near top and bottom and a minimum of 25 inches apart.

D. Coatings

1. Anodic Coating: Anodized finish conforming to Architectural Class II requirements 0.4 mil to 0.7 mil thickness (AA-MIO-C22-A31).

2. Organic Coating: Baked enamel finish with dry mil thickness of not less than 0.4 mil thickness (AAMA 603.8).

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: Comply with manufacturer's written instructions for protecting, handling, and installing entrance and storefront systems. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure non-movement joints. Seal joints watertight.

B. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Installation: Install components to drain water passing joints and condensation and moisture occurring or migrating within the system to the exterior.

D. Set continuous sill members and flashing in a full sealant bed to provide weathertight construction unless otherwise indicated.

E. Install framing components plumb and true in alignment with established lines and grades without warp or rack of framing members.

F. Install entrances plumb and true in alignment with established lines and grades without warp or rack. Lubricate operating hardware and other moving parts according to hardware manufacturer's written instructions.

1. Install surface-mounted hardware according to manufacturer's written instructions using concealed fasteners to greatest extent possible.

3.02 Erection Tolerances: Install entrance and storefront systems to comply with the following maximum tolerances:

A. Variation from Plane: Limit variation from plane or location shown to 1/8 inch in 12 feet in; ¼ inch over total length.

B. Alignment: Where surfaces abut in line, limit offset from true alignment to 1/16 inch. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.

C. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.

D. Adjust doors and hardware to provide tight fit at contact points and weather stripping, smooth operation, and weathertight closure.

E. Remove excess sealant and glazing compounds, and dirt from surfaces.

END OF SECTION

SECTION 08500
ALUMINUM WINDOWS

PART 1 – GENERAL

1.01 WORK INCLUDES

A Aluminum Windows

B. Glazing

C. Anchors and Fasteners

1.02 REFERENCES

A. Aluminum Association (AA)

B. American Architectural Manufacturer's Association (AAMA)

C. American Association of Architectural Metal Manufacturers (NAAMM)

D. American Society for Testing and Materials (ASTM)

1. ASTM B 633 – Electrodeposited Coatings of Zinc on Iron and Steel.

2. ASTM E 283 – Test Method for Determining the Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences Across the Specimen.

3. ASTM E 330 – Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors By Uniform Static Air Pressure Difference.

4. ASTM E 405 – Test Methods for Wear Testing Rotary Operators for Windows.

5. ASTM E 547 –Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Cyclic Static Air Pressure Differential.

6. ASTM E 774 – Classification of the Durability of Sealed Insulating Glass.

7. ASTM E 783 – Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors.

8. ASTM E 1105 – Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Curtain Walls, and Doors by Uniform or Cyclic Static Air Pressure Difference.

E. American Standards Institute (ANSI)

F. Federal Specification (FS)

G. National Association of Architectural Metal Manufacturer (NAAMM)

1.03 SUBMITTALS

A. Product Data for each type of window required, including construction details and fabrication methods; profiles and dimensions of individual components; data on hardware, accessories, and finishes. Include recommendations for maintaining and cleaning exterior surfaces.

B. Shop Drawings showing fabrication and installation of each type of window required. Include layout and installation details, elevations at ¼ inch = 1 foot (1:50) scale, typical window unit elevations at ¾ inch = 1 foot (1:20) scale, and full-size section details of typical composite members.

C. Samples for initial color selection on 12-inch long sections of window members. Where finishes involve normal color variations, include sample sets showing the full range of variations expected.

D. Test reports from a qualified independent testing agency indicating that each type, grade, and size of window unit complies with performance requirements indicated. Test results based on use of down-sized test units will not be accepted.

1.04 QUALITY ASSURANCE

A. Performance Requirements: Provide windows engineered, fabricated, and installed to withstand normal thermal movement, wind loading, and impact loading without failure, as demonstrated by testing manufacturer's standard window assemblies representing types, grades, classes, and sizes required for Project according to test methods indicated.

B. Testing shall demonstrate compliance with requirements indicated in AAMA 101 for air infiltration, water penetration, and structural performance for type, grade, and performance class of windows required. Where required design pressure exceeds the minimum for the specified window grade, comply with AAMA 101, Section 3, "Optional Performance Classes."

C. Test Criteria: Testing shall be performed by a qualified independent testing agency based on the following criteria:

1. Design wind velocity in accordance with site conditions.

2. Test Procedures: Test window units according to ASTM E 283 for air infiltration, ASTM E 547 for water penetration, and ASTM E 330 for structural performance.

PART 2 - PRODUCTS

2.01 WINDOWS

A. Aluminum Extrusions: Alloy and temper recommended for strength, corrosion resistance, and application of required finish, but not less than 22,000 psi ultimate tensile strength and not less than 0.062 inch thick at any location for main frame and sash members.

B. Fasteners: Aluminum, nonmagnetic stainless steel, epoxy adhesive, or other materials warranted to be non-corrosive and compatible with window members, trim, hardware, anchors, and other components.

1. Where fasteners screw anchor into aluminum less than 0.125 inch (3.2 mm) thick, reinforce interior with aluminum or nonmagnetic stainless steel to receive screw threads or provide standard, non-corrosive, pressed-in, splined grommet nuts.

2. Except for application of hardware, do not use exposed fasteners. For application of hardware, use fasteners that match finish of member or hardware being fastened, as appropriate.

C. Anchors, Clips, and Window Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel complying with ASTM B 633 and of sufficient strength to withstand design pressure indicated.

D. Hardware: Aluminum, stainless steel, or other corrosion-resistant material compatible with aluminum and of sufficient strength to perform the function for which it is intended.

1. Four-Bar Friction Hinges: Comply with AAMA 904.1.

a. Friction Shoes: Nylon or other nonabrasive, non-staining, non-corrosive, durable material.

2. Gear-Type Rotary Operators: Comply with AAMA 901.1 for rotary operators. Comply with ASTM E 405, Method A, when subjected to operating moments and closing torques indicated in AAMA 101.

    a. Operator shall operate all ventilators simultaneously, securely closing them at both jambs without using additional manually controlled locking devices.

3. Limit Device: Manufacturer's standard, concealed friction adjustor, adjustable stay bar, limit device designed to restrict ventilator opening.

4. Counterbalancing Mechanism: Comply with AAMA 902.2

    a. Sash-Balance Type: Concealed-spiral-spring type of size and capacity to hold sash stationary at any open position.

E. Accessories: Manufacturer's standard accessories that comply with indicated standards.

1. Window Cleaner Anchor Bolts: Standard design, nonmagnetic stainless steel, complying with governing regulations and ANSI A39.1.

2. Insert Screens: For each operable exterior sash or ventilator. Locate on inside or outside of window, depending on window type.

    a. Wire-Fabric Insect Screen: 18 x 18 mesh of 0.009 inch diameter, stainless steel wire, complying with FS RR-W-365, Type VI.

    b. Wickets: Sliding or hinged type wickets, framed and trimmed for a tight fit and durability during handling.

    c. Screen Frames: Tubular-shaped, extruded or formed-aluminum members of 0.004 inch minimum wall thickness, with mitered or coped joints and concealed mechanical fasteners. Finish frames to match window units.

        1) Provide removable PVC spline-anchor concealing edge of screen frame.

3. Weather-stripping: Sliding-type weather-stripping where sash rails slide horizontally or vertically along unit frame. Provide compression type weather-stripping at perimeter of each operating sash where sliding type is inappropriate.

   a. Provide weather stripping locked into extruded grooves in sash.

4. Pole Operators: One pole operator and pole hanger for every room that has operable windows more than 72 inches above floor. Fabricate pole of tubular-shaped anodized aluminum with rubber cap at lower end and standard push-pull hook at top. Provide sufficient length for window operation without reaching more than 60 inches above floor.

F. Casement Windows: Comply with requirements of AAMA Grade and Performance Class C-R15. Window units shall successfully pass vertical deflection and hardware load test performance requirements specified in AAMA 101.

1. Hardware: Equipment and operating hardware as follows:

   a. Operating Device: Gear-type rotary operator located on jamb at sill.

   b. Hinges: Concealed 4-bar friction hinges with adjustable slide shoe (2 per ventilator).

   c. Hinges: Heavy-duty, 3 knuckle butt hinges with nylon bushings (2 per ventilator).

G. Double-Hung Windows: Comply with requirements of AAMA Grade and Performance Class DH-R15. Window units shall successfully pass operating force test performance requirements specified in AAMA 101.

1. Provide window units with tilt-in feature permitting both sides of sash to be cleaned from interior.

2. Hardware: Equipment and operating hardware as follows:

   a. Sash Balances: Manufacturer's standard type (2 per sash).

   b. Sash Lock: Cam-action sweep lock and keeper on meeting rail.

c. Sash Lock: Pole-operated, cam-action locking device on meeting rail of windows with meeting rail more than 72 inches above floor.

d. Tilt Lock: Tamperproof, key-operated tilt mechanism to permit sash to tilt inward for cleaning.

e. Lift Handle: Applied sash lifts on bottom rail of lower sash (2 per sash).

f. Pull-Down Handles: Applied handles on bottom rail of upper sash (2 per sash).

H. Fixed Windows: Comply with requirements of AAMA Grade and Performance Class F-R15.

I. Fabrication: Window units to comply with indicated standards. Include a complete system for assembly of components and anchorage of window units. Provide units that are reglazable without dismantling sash or ventilator framing.

J. Thermally Improved Construction: Fabricate window units with an integral, concealed, low-conductance, thermal barrier, between exterior materials and window members exposed on interior, in a manner that eliminates direct metal-to-metal contact.

1. Weep holes and internal passage to conduct infiltrating water to exterior.

2. Provide water-shed members above side-hinges ventilators and similar lines of natural water penetration.

3. Sub-frames with anchors for windows, of profile and dimensions indicated but not less than 0.062 inch thick extruded aluminum. Miter or cope corners, and weld and dress smooth with concealed mechanical joint fasteners. Finish to match windows.

4. Mullions: Match window units. Provide anchors for support to structure and installation of windows. Allow for erection tolerances and provide for movement of windows due to thermal expansion and building deflection.

5. Glazing Stops: Screw-applied or snap-on glazing stops. Finish to match windows.

K. Pre-glazed Fabrication: Pre-glazed window units where possible and practical. Comply with glass and glazing requirements ofAAMA 101.

L. Finishes: Comply with NAAMM "Metal Finishes Manual." Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.

M. Class I, Clear Anodic Finish: AA-M12C22A41 or

N. Class I, Color Anodic Finish: AA-M12C22A42/A44. (as selected).

1. Color: Light bronze.
2. Color: Medium bronze.
3. Color: Dark bronze.
4. Color: Black.

O. Baked-Enamel Finish: AA-C12C42R1x. Apply baked enamel complying with paint manufacturer's specifications for cleaning, conversion coating, and painting.

1. Organic Coating: Thermosetting, modified-acrylic enamel primer and topcoat system complying with AAMA 603.8 except with a minimum dry film thickness of 0.7 mils, medium gloss.

a. Color: As selected

P. High Performance Organic Coating Finish: AA-C12C42Rax. (Organic Coating: as specified below). Prepare, pre-treat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's instructions.

1. Fluoropolymer 2-Coat Coating System: 2-coat, thermocured system composed of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidine fluoride resin by weight, complying with AAMA 605.2.

a. Color and Gloss: As selected by Architect from manufacturer's full range of choice for color and gloss.

Q. Glass and Glazing: Double glazing material: 0.12" inside and 0.12" outside of clear, sealed insulating glazing that complies with ASTM E774 Class A and is at least 1" overall thickness. Sash shall be factory glazed from the interior by the use of applied PVC glazing beads with EPDM glazing gaskets. The size of the bead shall accommodate the glass thickness. Provide tempered or safety glazing where required by code or industry safety standards.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Inspection: Inspect openings before installation. Verify opening is correct and sill plate is level.

B. Installation: Comply with manufacturer's recommendations for installing window units, hardware, operators, and other components. Set windows plumb, level, and true to line, without warp or rack of frames or sash. Anchor securely in place.

1. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action.

C. Set sill members and other members in a bed of sealant or with joint fillers or gaskets to provide weathertight construction. Coordinate installation with wall flashings and other components of the Work.

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D. Field Quality Control: Conduct on-site tests with window manufacturer's representative present. Testing shall be performed by a qualified independent testing agency.

1. Air-Infiltration Tests: Conduct according to requirements of ASTM E 783. Allowable infiltration shall not exceed 1.5 times the amount indicated.

2. Water-Resistance Tests: Conduct according to requirements of ASTM E 1105. No water leakage is permitted.

3. Window units not meeting specified requirements and units having similar deficiencies shall be corrected.

3.02 ADJUSTING AND CLEANING

A. Adjust operating sash and hardware to provide tight fit at contact points and weather-stripping for smooth operation and a weathertight closure.

B. Clean aluminum promptly after installing windows. Avoid damage to finishes. Remove excess glazing and sealant compounds, dirt, and other substances. Lubricate hardware and other moving parts.

C. Clean glass of pre-glazed units promptly after installing windows.

D. Protect installed aluminum windows to ensure that they are without damage or deterioration at the time of Substantial Completion.

END OF SECTION

SECTION 08560
PLASTIC WINDOWS

PART 1 – GENERAL

1.01 WORK INCLUDES

A. Casement Windows

B. Fixed Windows

C. Glass

1.02 REFERENCE STANDARDS

A. American Architectural Manufacturers Association (AAMA)

1. AAMA 101 – Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors.

2. AAMA 1503 – Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.

B. American Society of Mechanical Engineer (ASME)

1. ASME A39.1 – Safety Requirements for Window Cleaning.

C. American Society of Testing and Materials

1. ASTM D 3656 – Insect Screening and Louver Cloth Woven from Vinyl-Coated Glass Yarns.

2. ASTM D 4099 – Poly (Vinyl Chloride) (PVC) Prime Windows and Sliding Glass Doors.

1.03 SUBMITTALS

A. Shop Drawings: Submit shop drawings for the fabrication and installation of the window units and associated components of the work. Include wall elevations, unit elevations, and full-size section details of every typical composite member, including glazing. Data shall contain instructions for storage, handling and erection of windows.

B. Product Data: Submit manufacturer's specifications, standard details, and recommendations for each type of window unit required. Include information on installation, fabrication methods, finishing, hardware, glazing, and accessories. The Contractor shall submit test data in accordance with referenced standards included under this Section. The Contractor shall pay for all cost associated with obtaining required test data.

C. Guarantee: Provide written guarantee from manufacturer guaranteeing his work against material and workmanship defects in manufacture for a period of ten (10) years. Materials shall be covered in full by the manufacturer. The windows shall be guaranteed to operate under any normal temperature and humidity condition. This includes:

1. Hardware failure of any kind: screw stripping, frames and sashes failing in any way during normal use.

2. Insulated glass shall be guaranteed against seal failures causing clouding or fogging of any kind between the glass for a period of the (10) years.

D. Operation and Maintenance Manual: Indicate manufacturer, type, style, accessory list and finishes for each type of window provided. Include manufacturer's recommended maintenance and adjustment procedures.

1.04 QUALITY ASSURANCE

A. All windows shall be marked an AAMA/NWWDA & N.F.R.C. certification labels in accordance with requirements of the applicable referenced standard.

1.05 PERFORMANCE

A. Requirements indicated by the Drawings and these Specifications shall be considered as establishing minimum acceptable criteria and requirements as to design, function, construction, appearance, and quality.

B. Windows shall conform to the requirements AAMA/NWWDA & N.F.R.C. of Grade C-C70 for casements, and F-LC80 for fixed/picture units, AP-C60 for awning windows and labeled accordingly.

C. Thermal Performance: Glass shall be sealed insulating glazing and have .12" thick interior and exterior panes with Super Spacer, Low-E softcoat and filled with Argon gas. Overall product performance minimum allowed "U" = 0.30 for casements & .027 for fixed picture units.

D. Minimum clear opening requirement for egress windows shall comply with UBC 1204.

PART 2 - PRODUCTS

2.01 GENERAL

A. Windows shall be casement and picture type manufactured of extruded, high impact resistant, rigid polyvinyl chloride (PVC).

B. The manufacturer must have been in business over five (5) years.

2.02 CONSTRUCTION

A. Windows shall be constructed in a neat workmanlike manner. Frame and sash shall be constructed of extruded, high impact resistant, rigid polyvinyl chloride (PVC) with integral nailing fin.

All corners of the frame, sash, and mullions shall be miter cut and fusion welded. Welds are to be dressed and finished to match the surrounding surfaces.

Provisions for pressure equalization with baffled internal weepage shall be incorporated in the system. Profile in include integral flashing or nailing flange which shall have slotted holes for fasteners.

1. Weatherstrip: All operating sash shall be double weather stripped with extruded EPDM bulb. All weather stripping factory applied. Weather stripping shall be replaceable without the use of special tool or skills.

2. Glass and Glazing: Double glazing material: 0.12” inside and 0.12” outside of clear sealed insulating glazing and is at least 1” overall thickness. Sash shall be factory glazed from the interior by the use of applied PVC glazing beads with EPDM glazing gaskets. The size of the bead shall accommodate the glass thickness. Provide tempered or safety glazing where required by code or industry safety standards. Glazing to comply with Uniform Building Code.

3. Finish: Homogeneous color throughout profile material, i.e., pigment mixed with PVC prior to extrusion. Color shall be determined by Owner.

4. Screens: Operating vents shall be equipped with insect screens of aluminum extruded frames and 18 x 14 fiberglass mesh and vinyl

spline. The frames shall have a baked enamel finish to match the windows. Screens shall be removable from the inside with no special tools or knowledge.

5. Hardware: All hardware shall be heavy duty type with "E-Gard" finish or stainless steel components, or approved equal. Ventilators shall be rotary crank operated with hardened steel worm gear arm with 4-bar stainless steel hinge assembly. All screws and ancillary hardware shall be from stainless steel. Windows 24" high and over shall utilize multipoint locking hardware, operable by a single handle with locking points.

6. Drywall Return: Provide ¾" PVC return at interior side of window sill to receive finished wood sill. Provide ½" PVC return at interior side of window head and jab to receive gypsum board.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Comply with manufacturer's instructions, approved shop drawings, and recommendations for the installation of window units, hardware, accessories, and other components of the work.

B. Windows and glass stored on site shall be protected from extreme weather conditions and abuses from other crafts. They shall be placed in a location where handling during extreme cold conditions is not necessary.

C. Set units plumb, level, and true to line, without warp or rack of frames or sash. Provide proper support and anchor securely in place. Windows to be factory sized to fit in each framed opening to allow ½" clearance on all sides (tolerance +/- 1/16").

D. Adjust operating sash and hardware to provide a smooth operation with tight, weatherproof closure. Lubricate hardware and moving parts.

E. Glazing: Comply with the window manufacturer's instructions and recommendations for the installation of glass (which has not been pre-glazed), except as otherwise indicated.

F. Window and trim shall be installed by experienced workmen in accordance with the manufacturer's instructions and approved shop drawings.

G. After installation, surfaces of windows and trim shall be cleaned of all paint and other contaminants. Cleaning shall be accomplished with soap and water. Non-abrasive cleaners may be used. Under no circumstances should solvents be used for cleaning.

H. Contractor shall be responsible for protection of the work from damage by other trades or the weather and for final adjusting and cleaning. The Contractor shall also be responsible for providing warnings and instruction for care and maintenance.

END OF SECTION

SECTION 08900
CURTAIN WALLS

PART 1 – GENERAL

1.01 WORK INCLUDES

A Exterior Aluminum Window Framing

B. Glazing

1.02 REFERENCE STANDARDS

A. Aluminum Association (AA)

B. American Architectural Manufacturer's Association (AAMA)

C. American Society for Testing and Materials (ASTM)

1. ASTM E 283 – Test Method for Determining the Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences across the Specimen.

2. ASTM E 330 – Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

D. American Society of Civil Engineers (ASCE)

1.03 SUBMITTALS

A. Shop Drawings: Show details of fabrication and installation, including plans, elevations, sections, details of components, provisions for expansion and contraction, and attachments to other work.

B. Samples for Verification: Of each type of exposed finish required in manufacturer's standard sizes. Where finishes involve normal color and texture variations, include Sample sets showing the full range of variations expected.

C. Product Test Reports: Based on evaluation of tests performed by manufacturer and witnessed by a qualified independent testing agency, indicate compliance of entrance and storefront systems with requirements based on comprehensive testing of current systems.

D. Structural Calculations: Provide calculations prepared by an engineer licensed to practice in the State of Alaska.

1.04 QUALITY ASSURANCES

A. Assembly and installation shall be in accordance with the written instructions of the manufacturers.

B. Labels: Each unit shall bear a certification label from an independent, nationally recognized testing organization validating the product.

PART 2 - PRODUCT

2.01 ALUMINUM FRAMING

A. Performance

1. Structural Performance: Provide glazed aluminum curtain wall system, including anchorage, capable of withstanding wind-load design pressure calculated according to requirements of authorities having jurisdiction or
the American Society of Civil Engineers' ASCE 7, "minimum Design loads for Buildings and Other Structures," 6.4.2, "Analytical Procedure," whichever are more stringent.

2. Deflection of framing members in a direction normal to wall plane is limited to 1/175 or clear span or ¾ inches, whichever is smaller, ;unless otherwise indicated.

3. Deflection of framing members overhanging an anchor point is limited to 2 times the length of the cantilevered member, divided by 175.

4. Deflection of framing members in a direction normal to wall plane is limited to 1/360 of clear span, ¾ inches maximum, where plaster or gypsum board surfaces are subject to bending.

5. Test Performance: Provide glazed aluminum curtain wall system that does not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of clear span when tested according to ASTM E 330.

a. Test Pressure: 150 percent of inward and outward wind-load design pressure.

b. Duration: As required by design wind velocity, fastest 1 mile of wind for relevant exposure category.

6. Air Infiltration: Test in accordance with ASTM E283. Maximum infiltration shall not exceed 0.06 cubic feet per minute per square foot of fixed area at a test pressure of 9.24 pounds per foot.

7. Water Infiltration: There shall be no water penetration of water at a pressure of 8 pounds per square foot of fixed area.

8. Thermal Performance: The average thermal transmittance of the complete wall assembly including panels, windows, and other components shall not exceed a U Value of 0.44 and a minimum CFR of 67.

B. Fabrication

1. Aluminum Frames: Mill joints in frame members to a hairline fit, reinforce, and secure mechanically. Use countersunk stainless steel. Phillips screws a maximum 12 inches o.c. for exposed fastenings. Provide removable glass stops and glazing beads for fixed glass.

2. Aluminum Doors: Not less than 1-3/4 inches thick. Minimum wall thickness of 0.125 inch.

3. Welding and Fastening: Locate welds on unexposed surfaces where possible. Dress welds smoothly on exposed structures.

4. Anchors: Locate near top and bottom and a minimum of 25 inches apart.

5. Coatings.

a. Anodic Coating: Anodized finish conforming to Architectural Class II requirements 0.4 mil to 0.7 mil thickness (AA-MIO-C222-A31).

b. Organic Coating: Baked enamel finish with dry mil thickness of not less than 0.4 mil thickness (AAMA 603.8).

2.02 GLASS

A. Clear Float Glass: Type I, Class I, Quality 3-1/4 inch thickness.

B. Heat Absorbing Glass: Clean cut, Type I, Class II, Color as selected, thickness as selected.

C. Insulating Glass: Banded, Class A, encased in stainless steel frame.

PART - EXECUTION

3.01 GENERAL

A. Comply with manufacturer's written instructions for protecting, handling, and installing glazed aluminum curtain wall system. Do not install damaged components. Fit joints to produce hairline joints free of burrs and distortion. Rigidly secure non-movement joints. Seal joints watertight, unless otherwise indicated. Provide means to drain water to the exterior to produce a permanently weatherproof system.

B. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

3.02 INSTALLATION

A. Install components to drain water passing joints, condensation occurring in glazing channels, condensation occurring within framing members, and moisture migrating within the system to the exterior.

B. Install framing members plumb and true in alignment with established lines and grades.

C. Install factory-assembled frame units plumb and true in alignment with established lines and grades.

D. Install column covers plumb and true in alignment with established lines and grades.

E. Anchorage: After system components are positioned, fix connections to building structure as indicated on Shop Drawings.

1. Provide separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.

F. Welding: Weld components to comply with referenced standard and Shop Drawings, unless otherwise indicated. Weld in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.

G. Install glazing according to Shop Drawings.

H. Install sealant according to Shop Drawings.

I. Erection Tolerances: Install glazed aluminum curtain wall system to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet; ¼ inch in 40 feet.

2. Level: 1/8 inch in 20 feet; ¼ inch in 40 feet.

3. Alignment: Where surfaces abut in line, limit offset from true alignment to 1/16 inch; where a revealed or protruding element separates aligned surfaces by less than 2 inches, limit offset to ½ inch.

END OF SECTION

SECTION 09100
METAL SUPPORT ASSEMBLIES

PART 1 GENERAL

1.01 WORK INCLUDES

A. Suspension System for Ceilings

1.02 REFERENCE STANDARDS

A. American Society for Testing Materials (ASTM)

1. ASTM A 463 – Steel Sheet, Aluminum-Coated, by the Hot-Dip Process.

2. ASTM A 653 – Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

3. ASTM C 645 – Nonstructural Steel Framing Members.

4. ASTM C 754 – Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.

5. ASTM C 841 – Installation of Interior Lathing and Furring.

B. Metal Latch/Steel Framing Association (ML/SFA)

1. NAAMM / ML/SFA LLF – Metal Lathing and Furring.

C. Underwriters Laboratories (UL)

1. UL Fire Resist Dir – Fire Resistance Directory (Vol 1, 2A, 2B, & 3).

1.03 SUBMITTALS

A. Shop Drawings

1. Submit for the erection of metal ceiling suspension systems. Indicate materials, sizes, thicknesses, and fastenings.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the job site and store in ventilated dry locations. Storage area shall permit easy access for inspection and handling. If materials are stored outdoors, stack materials off the ground, supported on a level platform, and fully

protected from the weather. Handle materials carefully to prevent damage. Remove damaged items and provide new items.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General

1. Provide steel materials for metal support systems with galvanized coating ASTM A 653, Z 180 G-60; aluminum coating ASTM A 463, T1-75, T1-25; or a 55 percent aluminum-zinc coating.

B. Materials for Attachment of Gypsum Wallboard.

C. Suspended Ceiling Systems.

Part 3 - EXECUTION

3.01 INSTALLATION

A. Systems for Attachment of Gypsum Wall board

1. Suspended Ceiling System: ASTM C 754, except that framing members shall be 16 inches o.c. unless indicated otherwise.

3.02 ERECTION TOLERANCES

A. Framing members shall be level within 1/8” in 12’.

END OF SECTION

SECTION 09250
GYPSUM BOARD

PART 1 – GENERAL

1.01 WORK INCLUDES

A Gypsum Board (Regular and Type X)

B. Water Resistant Gypsum Board

C. Cementitious Back Units

D. Joint Treatment Materials

E. Fasteners & Accessories

1.02 REFERENCE STANDARDS

A. American National Institute (ANSI)

1. ANSI A 108.1 – Installation of Ceramic Tile; including A108.1A-C, 108.4 - .13, 118.1 - .10.

2. ANSI A 108.11 – Interior Installation of Cementitious Backer Units.

B. American Society for Testing and Materials (ASTM)

1. ASTM C 36 – Gypsum Wallboard

2. ASTM C 442 – Gypsum Backing Board, Gypsum Coreboard, and Gypsum Shaftliner Board.

3. ASTM C 475 – Joint Compound and Joint Tape for Finishing Gypsum Board.

4. ASTM C 514 – Nails for the Application of Gypsum Board.

5. ASTM C 557 – Adhesives for Fastening Gypsum Wallboard to Wood Framing.

6. ASTM C 630 – Water-Resistant Gypsum Backing Board.

7. ASTM C 840 – Application and Finishing of Gypsum Board.

8. ASTM C 954 – Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 inch to 0.112 inch Thickness.

9. ASTM C 1002 – Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.

10. ASTM C 1047 – Accessories for Gypsum Wallboard and Gypsum Veneer Base.

11. ASTM D 226 – Asphaltic-Saturated Organic Felt used in Roofing and Waterproofing.

C. Gypsum Association (GA)

1. GA 214 – Recommended Levels of Gypsum Board Finish.

2. GA 216 – Application and Finishing of Gypsum Board.

3. GA 224

4. GA 600 – Fire Resistance Design Manual

D. Underwriters Laboratories (UL)

1. UL Fire Resist Dir – Fire Resistance Directory (Vol.1, 2A, 2B, & 3)

1.03 SUBMITTALS

A. Product Data: Submit product data for gypsum board, cementitious backer units, Glass Mat Water-Resistant Tile Backing Board, Water-Resistant Gypsum Backing Board, Impact Resistant Gypsum Board, and Accessories

B. Certificates: Certify that gypsum board types, cementitious backer units, and joint treating materials do not contain asbestos.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Delivery

1. Deliver materials in the original packages, containers, or bundles with each bearing the brand name, applicable standard designation,

and name of manufacturer, or supplier. Protection from direct exposure to rain, snow, sunlight, or other extreme conditions.

B. Storage

1. Keep materials dry by storing inside a sheltered building. Where necessary to store gypsum board and cementitious backer units outside, store off the ground, properly supported on a level platform, and protected from direct exposure to rain, snow, sunlight, and other extreme weather conditions. Provide adequate ventilation to prevent condensation.

C. Handling

1. Neatly stack gypsum board and cementitious backer units flat to prevent sagging or damage to the edges, ends, and surfaces.

1.05 ENVIRONMENTAL CONDITIONS

A. Temperature

1. Maintain a uniform temperature of not less than 50 degrees F. in the structure for at least 48 hours prior to, during, and following the application of gypsum board, cementitious backer units, and joint treatment materials, or the bonding of adhesives.

B. Exposure to Weather

1. Protect gypsum board and cementitious backer unit products from direct exposure to rain, snow, sunlight, and other extreme weather conditions.

PART 2 - PRODUCT

2.01 MATERIALS

A. Gypsum Board: ASTM C 36.

1. Regular

a. 48 inches wide, or 5/8” thick, tapered, and tapered and featured edges.

2. Type X Fire-Resistant Gypsum Board: GA 600 and UL Fire Resist Dir.

   a. 48 inches wide, ½" or 5/8" thick, tapered or tapered and featured edges.

B. Gypsum Backing Board: ASTM C 442, gypsum backing board shall be used as a base in a multilayer system.

1. Regular

   a. 48 inches wide, 1/2 or 5/8 inch thick, square edges.

2. Type X, Fire-Resistant gypsum board

   a. 48 inches wide, ½ or 5/8 inch thick, square edges.

C. Regular Water-Resistant Gypsum Backing Board: ASTM C 630.

1. Regular

   a. 48 inches wide, 1/2 or 5/8 inch thick, tapered edges.

2. Type X, Fire-Resistant gypsum board

   a. 48 inches wide, ½ or 5/8 inch thick, tapered edges.

D. Cementitious Backer Units: ANSI A 108.1

E. Joint Treatment Materials: ASTM C 475.

1. Embedding Compound

   a. Specifically formulated and manufactured for use in embedding tape at gypsum board joints and compatible with tape, substrate and fasteners.

2. Finishing or Topping Compound

   a. Specifically formulated and manufactured for use as a finishing compound.

3. All-Purpose Compound

   a. Specifically formulated and manufactured to serve as both a taping and a finishing compound and compatible with tape, substrate and fasteners.

4. Setting or Hardening Type Compound

   a. Specifically formulated and manufactured for use with fiber glass mesh tape.

5. Joint Tape

   a. Cross-laminated, tapered edge, reinforced paper, or fiber glass mesh tape recommended by the manufacturer.

F. Fasteners

1. Nails: ASTM C 514.

2. Screws:

   a. ASTM C 1002, Type "G", Type "S", or Type "W" steel drill screws for fastening gypsum board to gypsum board, wood framing members and steel framing members less than 0.033 inch thick. ASTM C 954 steel drill screws for fastening gypsum board to steel framing members 0.033 to 0.112 inch thick. Provide cementitious backer unit screws with a polymer coating.

G. Adhesives: Do not use adhesive containing benzene, carbon tetrachloride, or trichloroethylene.

1. Adhesive for Fastening Gypsum Board to Metal Framing

   a. Type recommended by gypsum board manufacturer.

2. Adhesive for Fastening Gypsum Board to Wood Framing: ASTM C 557.

3. Adhesive for Laminating:

   a. For laminating two-ply gypsum board systems, provide adhesive recommended by gypsum board manufacturer.

H. Shaftwall Liner Panel

1. ASTM C 442. Shaftwall liner panel shall conform to UL Fire Resist Dir for the Design Number(s) indicated. Liner Panel shall be specifically manufactured for cavity shaftwall system, with water-resistant paper faces, bevel edges, single lengths to fit required conditions, 1" or ¾" thick.

I. Accessories

1. ASTM C 1047. Fabricate from corrosion protected steel or plastic designed for intended use. Accessories manufactured with paper flanges are not acceptable. Flanges shall be free of dirt, grease, and other materials that may adversely affect bond of joint treatment. Provide prefinished or job decorated materials.

J. Asphalt Impregnated Building Felt

1. The moisture barrier over gypsum sheathing shall be 15-lb asphalt impregnated felt conforming to ASTM D 226 Type I (No. 15)

K. Water

. 1. Clean, fresh, and potable.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Framing and Furring

1. Verify that framing and furring are securely attached and of sizes and spacing to provide a suitable substrate to receive gypsum board and cementitious backer units. Verify that all blocking, headers and supports are in place to support plumbing fixtures and to receive soap dishes, grab bars, towel racks, and similar items. Do not proceed with work until framing and furring are acceptable for application of gypsum board and cementitious units.

2. Gypsum Board and Framing: Verify that surfaces of gypsum board and framing to be bonded with an adhesive are free of dust, dirt, grease, and any other foreign matter. Do not proceed with work until surfaces are acceptable for application of gypsum board with adhesive.

3. Masonry and Concrete Walls: Verify that surfaces of masonry and concrete walls to receive gypsum board applied with adhesive are dry, free of dust, oil, form release agents, protrusions and voids, and any other foreign matter. Do not proceed with work until surfaces are acceptable for application of gypsum board with adhesive.

3.02 APPLICATION OF GYPSUM BOARD

A. General

1. Apply gypsum board to framing and furring members in accordance with ASTM C 840 or GA 216 and the requirements specified herein. Apply gypsum board with separate panels in moderate contact; do not force in place. Stagger end joints of adjoining panels. Neatly fit abutting end and edge joints. Use gypsum board of maximum practical length. Cut out gypsum board as required to make neat, close joints around openings. In vertical application of gypsum board, provide panels in lengths required to reach full eight of vertical surfaces in one continuous piece. Surfaces of gypsum board and substrate members may be bonded together with an adhesive, except where prohibited by fire rating(s). Treat edges of cutouts for plumbing pipes, screwheads, and joints with water-resistant compound as recommended by the gypsum board manufacturer. Provide type of gypsum board for use in each system specified herein as indicated.

2. Application for Single-Ply Gypsum Board to Wood Framing:

   a. Apply in accordance with ASTM C 840, System I or GA 216.

3. Application of Two-Ply Gypsum Board to Wood Framing:

   a. Apply in accordance with ASTM C 840, System II or GA 216.

4. Application Nail-On Application to Wood Framing

   a. Apply in accordance with ASTM C 840, System III or GA 216. This method may be used in lieu of ASTM C 840, System I at the option of the Contractor.

5. Adhesive Application to Interior Masonry or Concrete Walls.

   a. Apply in accordance with ASTM C 840, System VI or GA 216.

6. Application of Gypsum Board to Steel Framing and Furring:

   a. Apply in accordance with ASTM C 840, System III or GA 216.

7. Arches and Bending Radii

   a. Apply Gypsum Board in accordance with ASTM C 840, System IX or GA 216.

8. Gypsum Board for Wall Tile or Tile Base applied with adhesive.

   a. In dry areas, areas other than tubs, shower enclosures, saunas, gang shower rooms, apply glass matt water-resistant gypsum tile backing board or water-resistant gypsum backing board in accordance with ASTM C 840, System X or GA 216.

9. Exterior Application

   a. Apply exterior gypsum board, such as at soffits, in accordance with ASTM C 840, System XI or GA 216.

10. Floating Interior Angles:

    a. Locate the attachment fasteners adjacent to ceiling and wall intersections in accordance with ASTM C 840, System XII or GA 216, for single ply and applications of gypsum board to wood framing.

11. Control Joints

    a. Install expansion and contraction joints in ceilings and walls in accordance with ASTM C 840, System XIII or GA 216, unless indicated otherwise. Control joints between studs in fire-rated construction shall be filled with firesafing insulation to match the fire-rating of construction.

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12. Application of Foil-Backed Gypsum Board

a. Apply foil-backed gypsum board in accordance with ASTM C 840, System XIV or GA 216.

13. Application of Pre-decorated Gypsum Board

a. Apply pre-decorated gypsum board in accordance with GA 224. Attach pre-decorated gypsum board with adhesive and fasteners as recommended by the manufacturer. Conceal fasteners in the finished work.

3.03 APPLICATION OF CEMENTITIOUS BACKER UNITS

A. Application

1. In wet areas apply cementitious backer units in accordance with ANSI A 108.11. A 15 lb asphalt impregnated, continuous felt paper membrane shall be placed behind cementitious backer units, between backer units and studs or base layer of gypsum board. Membrane shall be placed with a minimum 6 inch overlap of sheets laid shingle style.

B. Joint Treatment: ANSI A 108.11.

3.04 FINISHING OF GYPSUM BOARD

A. Tape and finish gypsum board in accordance with ASTM C 840, GA 214 and GA 216. Plenum areas above ceilings shall be finished to Level 1 in accordance with GA 214. Water resistant gypsum backing board, ASTM C 630, to receive ceramic tile shall be finished to Level 2 in accordance with GA 214. Walls and ceilings to receive a heavy-grade wall covering or heave textured finish before painting without critical lighting to receive flat paints, light textures, or wall coverings shall be finished to Level 4 in accordance with GA 214. Unless otherwise specified, all gypsum board walls, partitions and ceilings shall be finished to Level 5 in accordance with GA 214. Provide joint, fastener depression, and corner treatment. Do not use fiber glass mesh tape with conventional drying type joint compounds; use setting or hardening type compounds only. Provide treatment for water-resistant gypsum board as recommended by the gypsum board manufacturer.

B. Uniform Surface

1. Wherever gypsum board is to receive eggshell, semi-gloss or gloss paint finish, or where severe, up or down lighting conditions occur, finish gypsum wall surface in accordance to GA 214 Level 5, in accordance with GA 214 Level 5. In accordance with GA 214

   Level 5, apply a thin skim coat of joint compound to the entire gypsum board surface, after the two-coat joint and fastener treatment is complete and dry.

C. Metal Trim for Pre-decorated Gypsum Board

1. Finish edges, ends, and joints of pre-decorated gypsum board, except pre-finished vee joints and monolithic type joints, with metal or plastic trim selected to match the gypsum board finish.

3.05 SEALING

A. Seal openings around pipes, fixtures, and other items projecting through gypsum board and cementitious backer units. Apply material with exposed surface flush with gypsum board or cementitious backer units.

B. Sealing for Glass Mat or Reinforced Gypsum Board Sheathing

1. Apply silicone sealant in a 3/8 inch bead to all joints and trowel flat. Apply enough of the same sealant to all fasteners penetrating through the glass mat gypsum board surface to completely cover the penetration when troweled flat.

3.06 FIRE-RESISTANT ASSEMBLIES

A. Wherever fire-rated construction is indicated, provide materials and application methods, including types and spacing of fasteners in accordance with code requirement. Joints of fire-rated gypsum board enclosures shall be closed and sealed in accordance with UL test requirements or GA requirements. Penetrations through rated partitions and ceilings shall be sealed tight in accordance with tested systems. Fire ratings shall be as indicated.

3.07 PATCHING

A. Patch surface defects in gypsum board to a smooth, uniform appearance, ready to receive finish as specified.

3.08 SHAFT WALL FRAMING

A. The shaft wall system shall be installed in accordance with the system manufacturer's published instructions. Bucks, anchors, blocking and other items placed in or behind shaft wall framing shall be coordinated with electrical and mechanical work. Fireproofing material which are damaged or removed during shaft wall construction shall be patched or replaced.

END OF SECTION

General Notes

1. *Use tapered and feature edge gypsum board with embedding and finishing compounds for smooth and flat surfaces are required.*

2. *For application of ceramic tile in wet area apply over cementitious backer units as a substrate. For other areas use gypsum board ASTM C 630 or ASTM C 1178.*

3. *For application of water-resistant gypsum board on ceilings the gypsum board shall be applied over supports at 12" o.c.*

4. *Wet areas are defined as tubs, showers, steam rooms, gang showers and the like.*

5. *Closer spacing of framing improves visual flatness and impact resistance.*

6. *Placing flanges of metal studs pointing in the same direction and attaching edges of gypsum board to unsupported edges improves visual flatness.*

7. *Attaching gypsum board to wood studs with screws resists fasteners popping better than other attachment methods.*

8. *Finish levels requirements are outlined in ASTM C 840 and include levels 0, 1, 2, 3, 4, and 5. Specify required Level(s).*

9. *Provide control joints in gypsum board in accordance with ASTM C 840.*

SECTION 09600
FLOOR FINISHES

PART 1 – GENERAL

1.01 WORK INCLUDES

A Sheet Vinyl

B. Vinyl Composition Tile

C. Rubber Floor System

D. Carpet

E. Ceramic and Quarry Tile

F. Athletic Flooring

G. Epoxy Floor System

1.02 REFERENCE STANDARDS

A. Tile Council of America.

1.03 SUBMITTALS

A. Product Data

B. Installation Instructions

C. Shop Drawing for the following:

1. Carpet Show Seams.

2. Athletic Flooring.

1.04 QUALITY ASSURANCE

A. Reference and Quality Control: The provision and preparation of the substrate and installation of the finish material shall be in accordance with the written instructions of the manufacturer.

PART 2 - PRODUCT

2.01 SHEET VINYL

A. Fire Resistance: Conform to flame spread requirements of locally adopted codes.

B. Life Expectance: Sheet vinyl flooring shall have a minimum serviceable life of 15 years with routine maintenance.

C. Minimum Width: 6 feet.

D. Thickness: 0.080 inch - overall
0.020 inch - wear layer

E. Static Load Limit: 750 psi.

F. Type: I.

G. Grade: I.

H. Slip Resistance: As required

2.02 VINYL COMPOSITION TILE (VCT)

A. Fire Resistance: Conform to flame spread requirements of locally adopted codes.

B. Life Expectance: VCT flooring shall have a minimum serviceable life of 15 years with routine maintenance.

C. Size: 12 inch x 12 inch.

D. Thickness: 1/8 inch.

E. Static Load Limit: 75 psi.

F. Class: I or II.

G. Slip Resistance: As required

2.03 RUBBER FLOORING SYSTEM

A. Fire Resistance: Conform to flame spread requirements of locally adopted codes.

B. Life Expectance: Rubber flooring shall have a minimum serviceable life of 15 years with routine maintenance.

C. Size: 18 inch x 18 inch or 36 inch x 36 inch.

D. Static Load Limit: 300 psi.

E. Tensile Strength: 900 psi.

F. Elongation: 200%.

G. Abrasion Resistance: 0.5 (H-18 Wheel), 1,000 cycle).

H. Minimum Thickness: .125 inch.

2.04 CARPET

A. Fire Resistance: Conform to flame spread requirements of locally adopted codes.

B. Life Expectance: Carpeting shall have a minimum serviceable life of 15 years with routine maintenance.

C. Fiber Material: Nylon with stain inhibitor applied during manufacturing and carbon-core filament for static control.

D. Face Construction

1. Construction: Textured loop.

2. Gauge: 1/13.

3. Pile Units per inch: 7.8.

4. Tuft Density: 101.4 tufts/sq. in.

5. Pile Height: 0.109” (average).

6. Pile Thickness: 0.084”.

7. Density Factor: .02 cu. yd.

8. Dye Method: 55% solution dyed, 45% yarn woven.

E. Primary Backing Material: Synthetic woven or nylon woven

F. Pre-Coat: Sealant vinyl.

G. Secondary Backing: Closed-cell, vinyl cushion.

1. Density: 18.5 lbs./cu. Ft.> +-5%.

2. Compression Set: 10% maximum.

3. Compression Deflection: 7 psi. @ 25% (minimum).

4. 25 psi. @ 25% (maximum).

5. Impermeable to moisture and airflow (including seam).

H. Backing System

1. Width: 6".

2. Weight: 35.5 oz./sq. yd.

3. Thickness: 0.156".

I. Performance Data

1. Electrostatic Propensity: 1.3 kv (maximum).

2. Colorfastness to Light: >-4 after 100 hours.

J. Warranty: Non-prorated twenty year warranty shall cover against:

1. Excessive Surface Wear: More than 15% less of pile fiber weight (maximum).

2. Excessive Static Electricity: More than 3.0 kv.

3. Resiliency Loss of Backing: More than 10% loss.

4. De-lamination.

5. Edge Ravel.

6. Zippering.

2.05 CERAMIC AND QUARRY TILE

A. General: Tile floor systems may be used on concrete and plywood substrates.

B. Use Compatibility: Tile floor systems are suitable for toilet/shower rooms, kitchens, common areas, and selected wet and high traffic.

C. Surface Characteristics: Non-slip.

D. Life Expectance: 15 years.

E. Size: Size and shape as selected, 5/16" thick.

F. Wear Rating: WE 4+.

G. Static Coefficient of Friction: Dry 1.0, Wet 0.9.

H. Water Absorption: 0.5%.

I. Scratch Hardness: MOH 7 (minimum).

J. Chemical Resistance:

K. Breaking Strength:

L. Concrete Substrate: Tile Council of America TCA F121.

M. Wood Substrate: Tile Council of America TCA F144.

2.06 ATHLETIC FLOORING

A. General: Three levels of solid pour urethane is described based on the type of substrate and the proposed level of usage (athletic activities).

1. Type I - Athletic Flooring is suitable for wood substrates where shock absorption requirements are minimal. Rough uses, such as rollerblading are not allowed.

2. Type II - Athletic Flooring is suitable for concrete and wood substrates. A rubber mat is provided prior to urethane application to provide medium level shock absorption. Rough uses are not allowed.

3. Type III - Athletic Flooring is suitable for concrete and wood substrates. A rubber mat is provided prior to urethane application to provide improved shock absorption. Uses such as rollerblading and free weight rooms are approved.

2.07 TYPE I – ATHLETIC FLOORING

A Materials

1. Primer: As approved by manufacturer.

2. Elastomeric Resin:
Thickness: 3/8".
Weight: 1/32.
Tensile Strength: 860 psi (minimum).
Elongation at Break: 300% (minimum).
Hardness: 55-60 Shore A.
Resiliency: 25.0 Impact.
Compression Set @ 50%: Immediate Recovery 98% (minimum).
Temperature Stability: No change from -35 deg. F. to 120 deg. F..
Abrasion Resistance: 0.25 gram weight loss per kilo at 5,000 cycles.
Moisture Absorption: 1% (maximum) by weight.
Fungus Resistance: 100%.
Flammability: 0.66 average watts/cm2 – radiant panel test..
Smoke Generated: 83 flaming.
Coating: Pigmented finish as approved by manufacturer.
Gameline Paint: As approved by the manufacturer.

3. Fire Resistance: Conform to flame spread requirements of locally adopted codes.

4. Life Expectance: 15 years with routine maintenance.

2.08 TYPE II – ATHLETIC FLOORING

A. Materials

1. Fire Resistance: Conform to flame spread requirements of locally adopted codes.

2. Adhesive: Two-component polyurethane as approved by manufacturer.

3. Adhesive: Two-component polyurethane as approved by manufacturer.

4. Resilient Base Mat: Granulated rubber with polyurethane binder as approved by manufacturer, ¼" thick.

5. Base Mat Sealer: Two components polyurethane as approved by manufacturer.

6. Polyurethane Resin:
   Material: Two component polyurethane.
   Thickness: 3/8".
   Tensile Strength: 1.275 psi (minimum).
   Elongation at Break: 180% to 200%.
   Hardness: 80 Shore A.
   Shock Absorption: 30%.
   Ball Bounce: .98%.
   Rolling Load Resistance (100 kilogram load): no damage).
   Flammability: Non-flammable.
   Life Expectance: 15 years with routine maintenance.

B. TYPE III – ATHLETIC FLOORING

1. Fire Resistance: Conform to flame spread requirements of locally adopted codes.

2. Life Expectance: 20 years with routing maintenance.

3. Adhesive: Two-component polyurethane as approved by manufacturer.

4. Resilient Base Mat: Granulated rubber with polyurethane binder as approved by manufacturer, ¼" thick.

5. Base Mat Sealer: Two components polyurethane as approved by manufacturer.

6. Polyurethane Resin:
Material: Two component polyurethane.
Thickness: 3/8".
Tensile Strength: 2,175 psi (minimum).

Elongation at Break: 110%.
Hardness: 62 Shore 5.
Shock Absorption: 25%.
Ball Bounce: .98%.

Point Load Rating: 370 psi @ 24 hour.
Color Fastness: 8 excellent.
Flammability: Non-flammable.

2.09 EPOXY FLOORING SYSTEM

A. General: Epoxy floor systems may be used on concrete and wood substrates in shops, mechanical rooms, toilet/shower rooms, and other "wet areas".

1. Fire Resistance: None-Flammable.

2. Life Expectance: 20 years with routing maintenance.

3. Materials:
Primer: As required by manufacturer for the substrate.
Body Coats: Epoxy.
Top Coats: Epoxy and Urethane.

4. Physical Properties:
Thickness: 3/16" (minimum).
Crack Bridging (Membrane): 250% of material thickness.
Hardness: 95 Shore A.
Abrasion: 88.4 mg. loss.
Tensile Strength: 2,525 psi.
Water Absorption: <0.2%.
Impact Resistance: 200 in/#.
Life Expectancy: 15 years with routing maintenance.

PART 3 - EXECUTION

3.01 SHEET VINYL

A. General: Seamless solid vinyl installations my be used in wet area such as toilet rooms, kitchens, wet areas of classrooms, and janitor closets. Joints are eliminated by bonding seams.

B. Concrete Substrates:

1. Concrete substrates shall be specified with the lowest practicable water-cement ratio and slumps. Water reducing admixtures (plasticizers may be used to reduce mixing water and aid concrete workability. Moist curing reduces concrete permeability. Curing compounds are prohibited.

2. For slab on grade construction:
Protect subsurface through proper drainage and grading away from building. Use a 10 mil vapor barrier under slab.

3. Sufficient slab drying time shall be allowed to dry to a moisture-emission level of 3 pounds of water/1,000 s.f. A slab under normal conditions takes approximately 30 days for each one inch of thickness. If construction schedule does not allow, specify acceptable measures for expediting the drying process. Specify testing requirements to assure acceptable moisture content.

C. Wood Substrates:

1. Underlayment grade plywood attached to sub-floor by gluing and screwing. Glue shall be applied immediately before placing each sheet of underlayment, apply to substrate and contact side of underlayment. Apply glue at the rate of one gallon for each 100 square feet. Screws shall be # 5x1" long (fully threaded flathead screws) at 8" o.c. at edges and 12" o.c. in field (each way). Underlayment ridges and bump shall be removed and low spots, cracks, joints, and holes shall be filled with filler as recommended by the flooring manufacturer. Substrate shall be smooth, flat with a maximum variation of 1/8" in 10 feet, clean, and have a maximum moisture content of 6%.

2. Air temperature at flooring installation area shall be maintained at a minimum of 70 deg. F for 3 days prior, during, and 24 ours after application.

3. Flooring material shall be stored in area of application for 3 days prior to application for equalization of temperature.

4. Specify moisture testing requirements.

3.02 VINYL COMPOSITION TILE

A. General: Seamless solid vinyl installations may be used in wet area such as toilet rooms, kitchens, wet areas of classrooms, and janitor closets. Joints are eliminated by bonding seams.

B. Concrete Substrates:

1. Concrete substrates shall be specified with the lowest practicable water-cement ratio and slumps. Water reducing admixtures (plasticizers may be used to reduce mixing water and aid concrete workability. Moist curing reduces concrete permeability. Curing compounds are prohibited.

2. For slab on grade construction:
Protect subsurface through proper drainage and grading away from building. Use a 10 mil vapor barrier under slab.

3. Sufficient slab drying time shall be allowed to dry to a moisture-emission level of 3 pounds of water/1,000 s.f. A slab under normal conditions takes approximately 30 days for each one inch of thickness. If construction schedule does not allow, specify acceptable measures for expediting the drying process. Specify testing requirements to assure acceptable moisture content.

C. Wood Substrates:

1. Underlayment grade plywood attached to sub-floor by gluing and screwing. Glue shall be applied immediately before placing each sheet of underlayment, apply to substrate and contact side of underlayment. Apply glue at the rate of one gallon for each 100 square feet. Screws shall be # 5x1" long (fully threaded flathead screws) at 8" o.c. at edges and 12" o.c. in field (each way). Underlayment ridges and bump shall be removed and low spots, cracks, joints, and holes shall be filled with filler as recommended by the flooring manufacturer. Substrate shall be smooth, flat with a maximum variation of 1/8" in 10 feet, clean, and have a maximum moisture content of 6%.

2. Air temperature at flooring installation area shall be maintained at a minimum of 70 deg. F for 3 days prior, during, and 24 ours after application.

3. Flooring material shall be stored in area of application for 3 days prior to application for equalization of temperature.

4. Specify moisture testing requirements.

3.03 RUBBER FLOOR SYSTEM

A. Concrete Substrates:

1. Concrete substrates shall be specified with the lowest practicable water-cement ratio and slumps. Water reducing admixtures (plasticizers may be used to reduce mixing water and aid concrete workability. Moist curing reduces concrete permeability. Curing compounds are prohibited.

2. For slab on grade construction:
Protect subsurface through proper drainage and grading away from building. Use a 10 mil vapor barrier under slab.

3. Sufficient slab drying time shall be allowed to dry to a moisture-emission level of 3 pounds of water/1,000 s.f. A slab under normal conditions takes approximately 30 days for each one inch of thickness. If construction schedule does not allow, specify acceptable measures for expediting the drying process. Specify testing requirements to assure acceptable moisture content.

B. Wood Substrates:

1. Underlayment grade plywood attached to sub-floor by gluing and screwing. Glue shall be applied immediately before placing each sheet of underlayment, apply to substrate and contact side of underlayment. Apply glue at the rate of one gallon for each 100 square feet. Screws shall be # 5x1" long (fully threaded flathead screws) at 8" o.c. at edges and 12" o.c. in field (each way). Underlayment ridges and bump shall be removed and low spots, cracks, joints, and holes shall be filled with filler as recommended by the flooring manufacturer. Substrate shall be smooth, flat with a maximum variation of 1/8" in 10 feet, clean, and have a maximum moisture content of 6%.

2. Air temperature at flooring installation area shall be maintained at a minimum of 70 deg. F for 3 days prior, during, and 24 ours after application.

3. Flooring material shall be stored in area of application for 3 days prior to application for equalization of temperature.

4. Specify moisture testing requirements.

3.04 SHEET VINYL

A. General: Seamless solid vinyl installations my be used in wet area such as toilet rooms, kitchens, wet areas of classrooms, and janitor closets. Joints are eliminated by bonding seams.

B. Concrete Substrates:

1. Concrete substrates shall be specified with the lowest practicable water-cement ratio and slumps. Water reducing admixtures (plasticizers may be used to reduce mixing water and aid concrete workability. Moist curing reduces concrete permeability. Curing compounds are prohibited.

2. For slab on grade construction:
Protect subsurface through proper drainage and grading away from building. Use a 10 mil vapor barrier under slab.

3. Sufficient slab drying time shall be allowed to dry to a moisture-emission level of 3 pounds of water/1,000 s.f. A slab under normal conditions takes approximately 30 days for each one inch of thickness. If construction schedule does not allow, specify acceptable measures foe expediting the drying process. Specify testing requirements to assure acceptable moisture content.

C. Wood Substrates:

1. Underlayment grade plywood attached to sub-floor by gluing and screwing. Glue shall be applied immediately before placing each sheet of underlayment, apply to substrate and contact side of underlayment. Apply glue at the rate of one gallon for each 100 square feet. Screws shall be # 5x1” long (fully threaded flathead screws) at 8” o.c. at edges and 12” o.c. in field (each way). Underlayment ridges and bump shall be removed and low spots, cracks, joints, and holes shall be filled with filler as recommended

by the flooring manufacturer. Substrate shall be smooth, flat with a maximum variation of 1/8" in 10 feet, clean, and have a maximum moisture content of 6%.

2. Air temperature at flooring installation area shall be maintained at a minimum of 70 deg. F for 3 days prior, during, and 24 ours after application.

3. Flooring material shall be stored in area of application for 3 days prior to application for equalization of temperature.

4. Specify moisture testing requirements.

3.05 CARPET

A. Concrete Substrates:

1. Concrete substrates shall be specified with the lowest practicable water-cement ratio and slumps. Water reducing admixtures (plasticizers may be used to reduce mixing water and aid concrete workability. Moist curing reduces concrete permeability. Curing compounds are prohibited.

2. For slab on grade construction:
Protect subsurface through proper drainage and grading away from building. Use a 10 mil vapor barrier under slab.

3. Sufficient slab drying time shall be allowed to dry to a moisture-emission level of 3 pounds of water/1,000 s.f. A slab under normal conditions takes approximately 30 days for each one inch of thickness. If construction schedule does not allow, specify acceptable measures foe expediting the drying process. Specify testing requirements to assure acceptable moisture content.

C. Wood Substrates:

1. Underlayment grade plywood attached to sub-floor by gluing and screwing. Glue shall be applied immediately before placing each sheet of underlayment, apply to substrate and contact side of underlayment. Apply glue at the rate of one gallon for each 100 square feet. Screws shall be # 5x1" long (fully threaded flathead screws) at 8" o.c. at edges and 12" o.c. in field (each way). Underlayment ridges and bump shall be removed and low spots, cracks, joints, and holes shall be filled with filler as recommended

by the flooring manufacturer. Substrate shall be smooth, flat with a maximum variation of 1/8" in 10 feet, clean, and have a maximum moisture content of 6%.

2. Air temperature at flooring installation area shall be maintained at a minimum of 70 deg. F for 3 days prior, during, and 24 ours after application.

3. Flooring material shall be stored in area of application for 3 days prior to application for equalization of temperature.

4. Specify moisture testing requirements.

3.06 CERAMIC AND QUARRY TILE

A. General: All tile system shall be place over a water proof membrane.

B. Substrate Deflection: <L/360

C. Systems
Concrete Substrate: Tile Council of America TCA F121.
Wood Substrate: Tile Council of America TCA F144.

3.07 ATHLETIC FLOORING

A. Concrete Substrates:

1. Concrete substrates shall be specified with the lowest practicable water-cement ratio and slumps. Water reducing admixtures (plasticizers may be used to reduce mixing water and aid concrete workability. Moist curing reduces concrete permeability. Curing compounds are prohibited.

2. For slab on grade construction:
Protect subsurface through proper drainage and grading away from building. Use a 10 mil vapor barrier under slab.

3. Sufficient slab drying time shall be allowed to dry to a moisture-emission level of 3 pounds of water/1,000 s.f. A slab under normal conditions takes approximately 30 days for each one inch of thickness. If construction schedule does not allow, specify acceptable measures foe expediting the drying process. Specify testing requirements to assure acceptable moisture content.

C. Wood Substrates:

1. Underlayment grade plywood attached to sub-floor by gluing and screwing. Glue shall be applied immediately before placing each

sheet of underlayment, apply to substrate and contact side of underlayment. Apply glue at the rate of one gallon for each 100 square feet. Screws shall be # 5x1" long (fully threaded flathead screws) at 8" o.c. at edges and 12" o.c. in field (each way). Underlayment ridges and bump shall be removed and low spots,

cracks, joints, and holes shall be filled with filler as recommended by the flooring manufacturer. Substrate shall be smooth, flat with a maximum variation of 1/8" in 10 feet, clean, and have a maximum moisture content of 6%.

2. Air temperature at flooring installation area shall be maintained at a minimum of 70 deg. F for 3 days prior, during, and 24 ours after application.

3. Flooring material shall be stored in area of application for 3 days prior to application for equalization of temperature.

4. Specify moisture testing requirements.

3.08 EPOXY FLOORING SYSTEMS

A. Concrete Substrate

1. A clean, dry, natural substrate is required for application of floor finish.

2. Shot blast is required to obtain a 3 mil profile for bonding to concrete.

B. Wood Structures

1. A clean, dry surface without grease, oils, and other contaminates shall be provided.

2. All screws shall be set below top of plywood and all joints shall be filled flush.

3. Primer bonding coat shall be applied over substrate and a 4" wide mesh shall b e embedded at all cracks and joints.

4. An elastomeric membrane shall be applied at 80 s.f. per gallon.

5. A body coat of resin shall be applied at 100 s.f. per gallon and color quartz broadcast to rejection.

6. Excess color quartz shall be removed and another bodycoat (100 s.f. per gallon) shall be applied and broadcast color quartz to rejection (remove excess).

7. One top coat of epoxy shall be applied to provide a uniform and even finish.

8. A top coat application of clear U.V. resistant urethane is required.

9. Traffic shall be prohibited for 72 hours after final coat. Ventilate area for 24 hours.

END OF SECTION

General Note

1. Quarry and Ceramic Tile should not be placed on plywood floor substrate where movement is expected.

2. Urethane Floors – avoid installation of field additives of mercury salts as a leveling agent due to future disposal issues for cured products.

3. Urethane Floor – provide slip joints under urethane over concrete substrate expansion joints.

SECTION 10150
TOILET PARTITIONS

PART 1- GENERAL

1.01 WORK INCLUDES

A. Toilet Enclosures

B. Urinal Screens

C. Partition Hardware

1.02 REFERENCE STANDARDS

A. Architectural & Transportation Barriers Compliance Board (ATBCB)

1. ATBCB ADA TITLE III – ADA Accessibility Guidelines for Buildings and Facilities.

B. U.S. General Services Administration (GSA)

1. CID A-A-60003 – Basic Partitions, Toilet, Complete.

1.03 SYSTEM DESCRIPTION

A. Toilet partition system, including toilet enclosures and urinal screens, shall be a complete and usable system of panels, hardware, and support components. The partition system shall be provided by a single manufacturer, and shall be a standard product as shown in the most recent catalog data.

1.04 SUBMITTALS

A. Shop Drawings

1. Showing plans, elevations, details of construction, hardware, reinforcing, fittings, mountings, and anchorings.

B. Product Data

1. Manufacturer’s technical data and catalog cuts including installation and maintenance instructions.

1.05 DELIVERY STORAGE AND HANDLING

A. Components shall be delivered to the jobsite in the manufacturer's original packaging with the brand, item identification, and project reference clearly marked. Components shall be stored in a dry location that is adequately ventilated; free from dust, water, or other contaminants; and shall have easy access for inspection and handling.

1.06 WARRANTY

A. Manufacturer's standard performance guarantees or warranties that extend beyond a 1 year period shall be provided.

PART 2 - PRODUCTS

2.01 TOILET ENCLOSURE

A. Toilet enclosures shall conform to CID A-A-60003, Type I, Style A, floor supported, ceiling hung, or overhead braced. Width, length, and height of toilet enclosures shall be as shown. Finish surface or panels shall be painted metal, laminated plastic, or solid plastic. Panels indicated to receive toilet paper holders or grab bars shall be reinforced for mounting of the items required. Grab bars shall withstand a bending stress, shear stress, shear force, and a tensile force induced by 250 lbf. Grab bars shall not rotate within their fittings.

2.02 URINAL SCREENS

A. Urinal screens shall conform to CID A-A-60003, Type III, floor supported ceiling hung, overhead braced, floor to ceiling post supported. Finish surface of screens shall be painted metal, laminated plastic, or solid plastic. Width and height of urinal screens shall be as shown. Secure wall hung urinal screens with a minimum of three wall stirrup brackets, 42 inch long, continuous flanges.

2.03 HARDWARE

A. Hardware for the toilet partition system shall conform to CID A-A-60003 for the specified type and style of partitions. Hardware finish shall be highly resistant to alkalies, urine, and other common toilet room acids. Latching devices and hinges for handicap compartments shall comply with ATBCB ADA TITLE III and shall be chrome-plated steel or stainless steel door latches that operate without either tight grasping or twisting of the wrist of the operator.

2.04 FINISHES

A. Partitions, panels, screen, and door finishes shall conform to CID A-A-6003 and shall be baked enamel, stainless steel, laminated plastic, or solid plastic fabricated of solid phenolic core with melamine facing sheets o polymer resins formed under high pressure rendering a single component section not less than one inch thick. Colors shall extend throughout the panel thickness. Exposed finish surfaces shall be smooth, waterproof, non-absorbant, and resistant to staining and marking with pens, pencils, or other writing devices. Solid plastic partitions shall not show any sign of deterioration when immersed in the following chemicals and maintained at a temperature of 80 degrees F for a minimum of 30 days.

Acetic Acid (80 percent)	Hydrochloric Acid (40 Percent)
Acetone	Hydrogen Peroxide Acid (30 percent
Ammonia (liquid)	Isopropyl Alcohol
Ammonia Phosphate	Lactic Acid (25 percent)
Bleach (12 percent)	Lime Sulfur
Borax	Nicotine
Brine	Potassium Bromide
Caustic Soda	Soaps
Chlorine Water	Sodium Bicarbonate
Citric Acid	Trisodium Phosphate
Copper Chloride	Urea; Urine
Core Oils	Vinegar

PART 3 - EXECUTION

3.01 INSTALLATION

A. Toilet partitions shall be installed straight and plumb with uniform clearance of ½ inch between pilasters and panels; 1 inch between pilasters and walls; and not more than 3/16 inch between pilasters and doors, in accordance with approved manufacturer's instructions with horizontal

lines level and rigidly anchored to the supporting construction. Where indicated, anchorage to walls shall be by through-bolting or toggle-bolting. Drilling and cutting for installation of anchors shall be at locations that will be concealed in the finished work. In the finished work, conceal evidence of drilling in floors and walls. Screws and bolts shall be stainless steel.

3.02 ADJUSTING AND CLEANING

A. Doors shall have a uniform vertical edge clearance of approximately 3/16 inch and shall rest open at approximately 30 degrees when unlatched. Baked enamel finish shall be touched up with the same color of paint that was used for the finish. Toilet partitions shall be cleaned in accordance with approved manufacturer's instruction and shall be protected from damage until accepted.

END OF SECTION

GENERAL NOTES

1. Painted metal partitions are not recommended in area exposed to rough usage such as locker rooms and area of know vandalism.

2. Plastic laminate partitions are not recommended where exposure to water is anticipated (i.e. shower partitions, where maintenance procedures include spraying water, etc.).

3. Stainless steel finishes are suitable for water exposure but do not perform well where physical abuse is expected.

4. The most durable partitions are the phenolic and polyethylene solid plastics and are resistant to physical abuse, humidity, water, and cleaning chemicals. A metal channel to cover the bottom of panels to prevent damage from matches and cigarette lighters should be considered.

5. Ceiling hung partitions enhance cleaning procedures. They should not be used if ceiling heights exceed eight feet.

SECTION 10260
WALL AND CORNER GUARDS

PART 1 - GENERAL

1.01 WORK INCLUDES

A. Resilient Corner Guards

B. Stainless Steel Corner Guards

C. Hardware

1.02 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM A 167 – Stainless and Heat-Resisting Chromioum-Nickel Steel Plate, Sheet, and Strip.

2. ASTM B 221 – Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

3. ASTM D 256 – Determining the IZOD Pendulum Impact Resistance of Plastics.

4. ASTM D 543 – Evaluating the Resistance of Plastics to Chemical Reagents.

5. ASTM D 635 – Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position.

6. ASTM E 84 – Surface Burning Characteristics of Building Materials.

7. ASTM G 21 – Determining Resistance of Synthetic Polymeric Materials to Fungi.

8. ASTM G 22 – Determining Resistance of Plastics to Bacteria.

B. Society of Automotive Engineers International (SAE)

1. SAE J 1545 - Instrumental Color Difference Measurement for Exterior Finishes. Textile and Colored Trim.

1.03 SUBMITTALS

A. Shop Drawings

1. Shop Drawings indicating locations and typical elevations of each type of item. Drawings shall show vertical and horizontal dimensions, full size sections, thickness of materials, and fastening details.

B. Product Data

1. Manufacturer's descriptive data, catalog cuts, installation instructions, and recommended cleaning instructions.

C. Test Reports

1. Fire rating and extinguishing test results for resilient material.

D. Certificates

1. Statements attesting that the items comply with specified fire and safety code requirements.

1.04 DELIVERY AND STORAGE

A. Materials shall be delivered to the project site in manufacturer's original unopened containers with seals unbroken and labels and trademarks intact. Materials shall be kept dry, protected from weather and damage, and stored under cover. Materials shall be stored at approximately 70 degrees for at least 48 hours prior to installation.

1.05 WARRANTY

A. Manufacturer's standard performance guarantees or warranties that extend beyond a 1 year period shall be provided.

PART 2 - PRODUCTS

2.01 GENERAL

A. To the maximum extent possible, corner guard, and wall guards shall be the standard products of a single manufacturer and shall be furnished as detailed. Drawings show general configuration of products required, and items differing in minor details from those shown will be acceptable.

B. Resilient Material shall consist of high impact resistant extruded acrylic vinyl, polyvinyl chloride, or injection molded thermal plastic and shall conform o the following:

C. Fire Rating shall be Class 1 when tested in accordance with ASTM E 84, having a maximum flame spread of 25 and a smoke developed rating of 450 or less. Material shall be rated self extinguishing when tested in accordance with ASTM D 635. Material shall be labeled and tested by an approved nationally known testing laboratory.

D. Minimum Impact Resistance shall be 960.8 N. m/m (18ft. lb/sq inch) 18 ft. lbs/sq inch when tested in accordance with ASTM D 256, Izod impact, ft. lbs per sq inch notched).

E. Integral Color: components shall have integral color and shall be matched in accordance with SAE J 1545 to within plus or minus 1.0 on the CIE-LCH scales.

F. Chemical and Stain Resistance shall be resistant to chemicals and stains reagents in accordance with ASTM D 543.

G. Fungal and Bacterial Resistance shall be resistant to fungi and bacteria in accordance with ASTM G 21 or ASTM G 22, as applicable.

2.02 CORNER GUARDS

A. Resilient Corner Guards

1. Resilient corner guard; units shall be flush mounted or surface mounted type, radius formed to profile shown. Mounting hardware, cushions, and base plates shall be furnished. Assembly shall consist of a snap-on corner guard formed from high impact resistant resilient material, minimum 0.078 inch thick, mounted on continuous aluminum retainer. Extruded aluminum retainer shall conform to ASTM B 221, alloy 6063, temper T5 or T6. Flush mounted type guards shall act as a stop for adjacent wall finish material. Factory fabricated end closure caps shall be furnished for top and bottom of surface mounted corner guards. Flush mounted corner guards installed in fire rated wall shall maintain the rating of the wall. Insulating materials that are an integral part of the corner guard system shall be provided by the manufacturer of the corner guard system. Exposed metal portions of fire rated assemblies shall have a paintable surface.

B. Stainless Steel Corner Guards

1. Stainless Steel corner guards shall be fabricated of 0.0625 inch thick material conforming to ASTM A 167, type 302 or 304. Corner guards shall extend from floor to ceiling. Corner guard shall be formed to dimensions shown.

2.03 FINISH

A. Stainless Steel Finish shall be in accordance with ASTM A 167, Type 302 or 304.

B. Resilient Material Finish shall be embossed, velour, stipple, or high gloss vinyl texture.

2.04 Adhesive

A. Adhesive for resilient material shall be in accordance with manufacturers recommendations.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Corner Guards

1. Material shall be mounted at location indicated in accordance with manufacturer's recommendations.

END OF SECTION

SECTION 10615
DEMOUNTABLE PARTITIONS

PART 1 - GENERAL

1.01 WORK INCLUDES

A. Full Height Demountable Partitions

1.02 REFERENCE STANDARDS

A. American Society of Testing and Materials (ASTM)

1. ASTM C 36 – Gypsum Wallboard.

2. ASTM C 442 – Gypsum Backing Board and Coreboard.

3. ASTM E 72 – Conducting Strength Tests of Panels for Building Construction.

4. ASTM E 84 – Surface Burning Charqcteristics of Building Materials.

5. ASTM E 90 – Laboratory Measurement of Airborne Sound Transmission Loss of Building

6. ASTM E 199 – Fire Rests of Building Construction and Materials.

7. ASTM E 413 – Rating Sound Insulation.

1.03 SUBMITTALS

A. Shop Drawings

1. Drawings indicating plans and elevations of demountable partitions, details of required supports, adjacent construction and finish trim, finish of miscellaneous components and accessories, and type of partition finish.

B. Product Data

1. Product Data including catalog cuts indicating compliance with requirements of this section and manufacturer’s published installation and maintenance recommendations.

C. Certificates

1. Fire-Resistance Rating and Burning Characteristics) in accordance with design requirements.

Acoustical Performance (in accordance with design requirements).

Structural Performance (in accordance with design requirements).

Test reports from an independent laboratory certifying that the demountable partitions meet the specified fire-resistance ratings, acoustical performance, and structural performance.

1.04 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Rating and Burning Characteristics: Fire-resistance rating for demountable partitions shall be one-hour and in conformance with ASTM E 119. Partition system shall have a Class A Flame Spread Rating in conformance with ASTM E 84.

B. Acoustical Performance shall have a minimum Sound Transmission Coefficient STC of 42. STC range shall be determined in accordance with Sound Transmission Test by Two-Room Method and reported in accordance with ASTM E 90 or ASTM E 413 for frequency data. Tested assembly shall have been assembled in the same manner that the demountable partitions will be installed on the project.

C. Structural Performance: Demountable partitions shall be able to sustain a 5 psf minimum transverse loading, support the design hung workstation component with panel deflection no greater than $1/120^{th}$ of the vertical span when tested in accordance with ASTM E 72.

1.05 QUALIFICATIONS

A. Manufacturer shall specialize in designing and manufacturing the type of demountable partition specified in this section, and shall have a minimum of five years of documented successful experience. Manufacturer shall have the facilities capable of meeting contract requirements, single-source responsibilities and warranty. Partition installer shall have a minimum of 5 years of documented successful experience in the installation of demountable partitions similar to the requirements of this section.

1.06 DELIVERY, STORAGE AND HANDLING

A. Materials shall be delivered to project site in accordance with manufacturer's instructions in original unopened and undamaged packages and stored in a clean, dry, and secure place free from damage during construction activities. Packages shall contain labels which indicate manufacturer's name, brand name, size, finish and placement location.

1.07 PROJECT/SITE CONDITIONS

A. Before fabrication of demountable partitions, field dimensions shall be certified and recorded on shop drawings. Fabrication schedule shall be coordinated with construction schedule and progress to avoid delay in the work. Temperature and humidity conditions within the area to receive partitions shall be maintained as close as possible to the final occupancy standards. A minimum of 60 degrees F shall be maintained continuously. Installation shall not begin until the building envelope provides complete protection from the weather.

PART 2 - PRODUCTS

2.01 DEMOUNTABLE PARTITION TYPE

A. Demountable partition system shall consist of a series of individual, floor-supported, floor-to-ceiling pre-fabricated panels as shown. Top channel shall hold panels in place and shall accommodate a floor-to-ceiling variation. Partition system shall be complete with accessories to meet fire-rated and acoustical performance requirements. Demountable partition system shall provide accommodations for electrical switches and outlets. Building electrical power shall be ceiling feed or end mount base feed.

2.02 MATERIALS AND COMPONENTS

A. Partition Panels shall be manufacturer's standard gypsum board construction with fillers as required. Gypsum boards shall be minimum ½ inch thick conforming to ASTM C 36. Gypsum backing board shall conform to ASTM C 442. Panels shall be complete with tongue-and-groove or panel clips at joints to align panels with concealed slots to support hang-on brackets and accessories. Maximum total load for bracket supports on one or both wall surfaces shall not exceed 1240 lb. Metal-faced panel construction with fillers or bracing as required. Metal panels shall be minimum 0.0224 inch thick. Panels shall be complete with panel connectors at joints to align panels or concealed slots for hand-on brackets and accessories. Maximum total load for bracket supports on one

or both wall surfaces shall not exceed 1240 lb welded, roll-formed, galvanized steel frame containing 2-3/4 inch gypsum sheets covered with vinyl or fabric. The mineral wool core plus the gypsum sheets shall provide the specified acoustic and fire-resistant properties. The panel system shall meet the specified structural performance.

B. Framing system shall consist of extruded anodized aluminum or roll-formed steel components which include ceiling runners, floor track, starting units, studs or posts, bracing, and suitable treated fasteners to prevent corrosion. Post covers shall be provided if applicable. When assembled, framing system with panels shall form a rigid, stable partition.

C. Base trim: Base trim shall be nominal 4 inch high without exposed fasteners. Base shall be either of the following: Snap-on vinyl cove base, clip-on metal base, adhesive-applied vinyl cove base.

2.03 FINISHES

A. Finishes for exposed steel or aluminum trim surfaces shall be selected from manufacturer's standard materials and colors. Metal faces panels shall have enamel paint finish. Gypsum Board panels shall be finished with pre-applied vinyl wallcovering, finish shall be type II, medium duty, UL Class A conforming to ASTM E 84.

PART 3 - EXECUTION

3.01 PREPARATION

A. Locations scheduled to receive demountable partitions shall be inspected for compliance with manufacturer's requirements. Floor and ceiling dimensions shall be verified in accordance with approved shop drawings prior to starting the work. Floor under partitions shall be level to within 1/8 inch in 10 feet, non-accumulative. Conditions which my adversely affect the partition installation shall be corrected before installing partitions.

3.02 INSTALLATION

A. Demountable partitions shall be installed in accordance with approved shop drawings and manufacturer's published instructions. The system shall be assembled and erected with the least possible drilling and cutting of existing construction and shall be capable of disassembly be means of ordinary tools. The partition installation shall be complete with accessories to meet specified requirements.

B. Wall base shall be installed in the longest lengths possible. Joints shall be fitted tight. Internal corners shall be mitered. Base shall be scribed to fit to door frames and other obstructions. Base shall tightly adhere to wall surface.

3.03 ADJUSTMENTS

A. Damaged partition finish and components and damaged floor and ceiling finishes shall be repaired to the original conditions or replaced.

3.04 CLEANING

A. Upon completion of installation partition components and finishes shall be cleaned in accordance with partition manufacturer's recommendations. Alkaline or abrasive agents shall not be used. Precautions to avoid scratching or marring partition finish surfaces shall be exercised.

3.05 PROTECTION

A. Demountable partitions shall be protected from damage through the duration of construction activities.

END OF SECTION

SECTION 10652
OPERABLE PANEL PARTITIONS

PART 1 - GENERAL

1.01 WORK INCLUDES

A. Manually Operated Panel Partitions

B. Electrically Operated panel Partitions

1.02 REFERENCE STANDARDS

A. American Society of Testing and Materials (ASTM)

1. ASTM E 84 – Surface Burning Characteristics of Building Materials.

2. ASTM E 90 – Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

3. ASTM E 152 – Fire Test of Door Assemblies.

4. ASTM E 336 – Measurement of Airborne Sound Insulation in Buildings.

5. ASTM E 557 – Architectural Application and Installation of Operable Partitions.

B. National Fire Protection Association (NFPA)

1. NFPA 70 – National Electrical Code.

2. NFPA 252 – Fire Tests of Door Assemblies.

C. Underwriters Laboratories (UL)

1. UL 10 B – Fire Tests of Door Assemblies.

1.03 SUBMITTALS

A. Shop Drawings

1. Submit drawings for the system that include dimensions and weight of stacked partition, layout of the work, track and jamb fastening methods, seal details, and installation details. Submit wiring diagram and installation details for electrical operator.

B. Product Data

1. Manufacturer's descriptive data, performance charts, catalog cuts, and installation instructions for framework, suspension system, covering, accessories, and electrical operators.

C. Reports

1. Reports on laboratory acoustical tests and flame and smoke development tests.

D. Certificates

1. Certificates attesting that the materials meet the requirements specified and that partitions have specified acoustical and flame retardant properties, as determined by tests.

E. Operation and Maintenance Data

1. Operating instructions outlining the procedures required for electrically operated partitions. The instructions shall include the manufacturer's name, model number, service manual, pats list, and brief description of all equipment and operating features. Data shall include a complete list of parts and supplies, with current unit prices and source of supply, and a list of the parts recommended by the manufacturer to be replaced after 1 year and 3 years of service. The maintenance instructions shall explain routine maintenance procedures including inspection, adjustments, lubrication, and cleaning. The instructions shall list possible breakdown, methods or repair, and a troubleshooting guide. The instructions shall include equipment layout and simplified wiring and control diagrams of the system as installed.

1.04 DELIVERY, HANDLING AND STORAGE

A. Deliver materials to project site in the manufacturer's original, unopened, and undamaged package with labels legible and intact. Provide labels to indicate the manufacturer, brand name, size, finish, and placement location. Store folding partitions and accessories in unopened packages in a manner that will prevent damage. Handle partition materials in accordance with manufacturer's instructions.

1.05 WARRANTY

A. Partitions shall be warranted against defects in material and workmanship for a period of two years from date of installation.

PART 2 - PRODUCTS

2.01 OPERABLE PANEL PARTITIONS

A. Provide panel partitions, factory finished, supported from overhead track without floor guides, and complete with hardware, track, and accessories necessary for operation. Provide concealed framework with a covering of vinyl fabric, carpet, or steel (painted). Provide partitions manually or electrically operated, center stacked or omni-directional. Provide chalkboards/markerboards, and tackboards in accordance with design requirements. Provide operable panel wall with a Sound Transmission Class (STC) and, Noise Reduction Coefficient (NRC), and fire ratings in accordance with design requirements.

2.02 MATERIALS

A. Fabric Covering: Vinyl or looped fabric, ASTM E 84, flame spread rating 25 or less, fuel contribution rating of 15 or less, smoke generation of 50 or less.

B. Seals and Sweepstrips: Provide perimeter seals of manufacturer's standard product, without crack or craze when subjected to severe usage. Provide mechanical seal top and bottom of the fire rated panel. Provide mechanical bottom seal that can be raised or lowered for positive control. Provide manufacturer's vertical seals between panels to ensure acoustical and fire rating.

C. Ceiling Guards: Furnish partitions with ceiling guards or integral track and ceiling guards as recommended by the manufacturer.

D. Chalkboards/Markerboards: With aluminum or steel frame with writing surface of porcelain steel and shall not protrude 1/8 inch beyond panel face.

E. Tackboard: With steel or aluminum frame. Minimum ¼ inch thick, tacking surface covered with self-sealing decorative vinyl. Tacking surfaces laminated to rigid backing substrate.

2.03 PERFORMANCE REQUIREMENTS

A. Fire Endurance: For partitions more than 60 square feet in area, provide fabric and lining with flame spread rating of 25 or less, fuel contribution rating of 15 or less, smoke generation of 50 or less when tested in

accordance with ASTM E 84. 1 Hour fire rating, UL 10 B, ASTM E 152, or NFPA 252.

B. Laboratory Acoustical Requirements tested in accordance with ASTM E 90 by a laboratory accredited by the National Institute of Standards and Technology. Partitions shall attain a sound transmission class (STC) in accordance with design requirements in a fully extended position. Partition tested shall be provided and shall be fully operable. Test specimen shall be not less than 126 square feet in area and 14 feet by 9 feet.

C. Electrical Operators: Provide manufacturer's recommended standard electrical operator for each partition. Provide wiring diagrams.

2.04 FABRICATION

A. Panel Construction

1. Provide panels of 24 gage minimum steel skin or tackable base, laminated to appropriate structural acoustical backing, mounted in full perimeter protective frame of steel or steel reinforced aluminum. Frame shall enclose and protect all edges of the surface material. Provide panel finish of vinyl fabric or ready for field painting. Provide continuously hinged panels. Provide porcelain enamel chalkboard/markerboard in accordance with design requirements. Panel weight shall be a minimum of 5.5 pounds per square foot for STC up to 40, 7.5 pounds per square foot for STC up to 45, and 8.5 pounds pe square foot for STC up to 50, 10.0 pounds per square foot for STC up to 53.

B. Suspension System

1. Provide a suspension system consisting of steel or heavy duty extruded aluminum track connected to the structural support by threaded rods, and trolleys designed to support the weight of the partition. Provide steel track of 7 gage minimum, phosphate treated or painted. Provide extruded aluminum track with minimum thickness 1/8 inch. Tracks may have an integral ceiling

guard. Provide two trolleys per panel with four ball bearing steel wheels.

2. Hardware: Provide heavy-duty type hardware standard with the manufacturer. Provide pulls and latches for all partitions. Provide partitions with keyed locks.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Inspection

1. Check openings scheduled to receive operable partitions for correct dimensions. Install partitions in accordance with the approved partition layouts, manufacturer's directions, and ASTM E 557. Structural support for the track support elements shall be as indicated.

B. Electrical Operators

1. Conform electrical components and installation to the requirements of NFPA 70. Provide the partition manufacturer's standard drive and control components required to operate the partition.

C. Adjustment

1. Adjust manually operated partitions to open and close from any position with a maximum horizontal force of 30 pounds applied to panel. Adjust drive components and limit switches of electrically operated partitions to ensure the partitions operate properly upon activation of the control switch.

3.02 FIELD TEST

A. Operational Test:

1. Operate partition at least three times to demonstrate that partition is capable of being moved from the stored position to the fully extended position smoothly and quietly and without overloading the drive components. Activate the emergency release mechanism and demonstrate proper operation of the partition in the manual mode. Activate mechanical seals top and bottom. Adjust partitions which do not operate properly and retest.

B. Visual Test

1. Conduct visual field tests for light leakage with all room lights turned on in the space on one side of the partition. Darken space on the other side of the partition. There shall be no light leakage

from the lighted space to the darkened space. If light leakage does occur, adjust the partition to correct the problem and retest.

C. Acoustical Test

1. Field sound performance: Partition shall be tested in accordance with ASTM E 336, and achieve a Noise Isolation Class (NIC) in accordance with design requirements.

3.03 CLEANING

A. Clean any soiled parts of the partition in accordance with manufacturer's printed instructions.

END OF SECTION

General Notes

1. Partitions require a floor, end, and ceiling to avoid gaps that will lower the sound transmission class (STC) rating.

2. Provide a barrier in the ceiling space above the partition equal to the STC rating of the partition.

3. Large operable partition are difficult for manual operation. Provide electrical operation.

SECTION 10655
ACCORDION FOLDING PARTITIONS

PART 1 - GENERAL

1.01 WORK INCLUDES

A. Folding Partitions

B. Electrical Operators

1.02 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM A 653 – Steel Sheet Zinc-Coated (Galvanized) or Zinc-Iron Alloy –Coated (Galvannealed) by the Hot-Dip Process.

2. ASTM B 221 – Aluminum and Aluminum-Alloy Exruded Bars, Rods, Wire, Profiles, and Tubes.

3. ASTM E 84 – Surface Burning Characteristics of Building Materials.

4. ASTM E 90 – Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

5. ASTM E 336 – Measurement of Airborne Sound Insulation in Buildings.

6. ASTM E 557 – Architectural Application and Installation of Operable Partitions.

B. Chemical Fabrics & Film Association (CFFA)

1. CFFA W 101 B – Vinyl Coated Fabric Wallcovering

C. National Fire Protection Association (NFPA)

1. NFPA 70 – National Electrical Code

1.03 SUBMITTALS

A. Shop Drawings

1. Shop Drawings for the system that include dimensions and weight of stacked partition, layout of the work, track and jamb fastening

methods, seal details, and installation details. Submit wiring diagram and installation details for electrical operator.

B. Product Data

1. Manufacturer's descriptive data, performance charts, catalog cuts, and installation instructions for framework, suspension system, covering, accessories, and electrical operators.

C. Reports

1. Reports on laboratory acoustical tests and flame and smoke development tests.

D. Certificates

1. Certificates attesting that the materials meet the requirements specified and that partitions have specified acoustical and flame retardant properties, as determined by tests.

E. Operation and Maintenance Data

1. Operating instructions outlining the procedures required for electrically operated partitions. The instructions shall include the manufacturer's name, model number, service manual, pats list, and brief description of all equipment and operating features. Data shall include a complete list of parts and supplies, with current unit prices and source of supply, and a list of the parts recommended by the manufacturer to be replaced after 1 year and 3 years of service. The maintenance instructions shall explain routine maintenance procedures including inspection, adjustments, lubrication, and cleaning. The instructions shall list possible breakdown, methods or repair, and a troubleshooting guide. The instructions shall include equipment layout and simplified wiring and control diagrams of the system as installed

1.04 GUARANTY

A. Partitions shall be guaranteed against defects in material and workmanship for a period of two years from date of installation. In addition, the pantographs, trolleys and tracks shall be guaranteed for 10 years from date of acceptance for beneficial use.

1.05 DELIVERY, HANDLING AND STORAGE

A. Delivery materials to project site in manufacturer's original, unopened, and undamaged packages with labels legible and intact. Labels to indicate the manufacturer, brand name, size, finish, and placement location. Store folding partitions and accessories in unopened packages in a manner that will prevent damage. Handle partition materials in accordance with manufacturer's instructions.

.PART 2 - PRODUCTS

2.01 FOLDING PARTITIONS

A. Provide full accordion type partitions, factory finished, supported from overhead track without floor guides, and complete with all hardware, track, and accessories necessary for operation. Provide partition framework with a mechanism that gives stability and maintains uniform spacing of partition folds in all partition positions. Provide completely concealed framework with a vinyl-coated fabric covering. Provide partitions manually and electrically operated, bi-parting and one-way type as indicated. Provide manufacturer's standard pendant pull on leading edge of manually operated partitions over 12 feet high.

2.02 MATERIALS

A. Aluminum Extrusions: ASTM B 221, Alloy 3003.

B. Steel Sheets: ASTM A 653.

C. Fabric Covering: CFFA W 101 B, Type II.; ASTM E 84, flame spread rating, 25 or less, fuel contribution of 15 or less, smoke generation of 50 or less.

D. Seals and Sweepstrips: Provide perimeter seals of manufacturers standard product, without crack or craze when subjected to severe usage.

E. Ceiling Guards: Furnish partitions with ceiling guards or integral track and ceiling guards as recommended by the manufacturer.

2.03 PERFORMANCE REQUIREMENTS

A. Laboratory Acoustical Requirements

1. Folding partitions shall have been tested in accordance with ASTM E 90 by a laboratory accredited by the U.S. Bureau of Standards

and have attained a sound transmission class, in accordance with design requirements, in a fully extended position. Partition tested shall be of the same construction, materials, and model number as the partition to be provided and shall be fully operable. Test specimen shall be not less than 126 square feet in area (14' x 9'). Panel weight shall be 5 lbs per square feet.

2.04 Electrical Operators

A. Provide manufacturer's recommended standard electrical operator for partitions. Provide wiring diagrams.

2.05 FABRICATION

A. Frame Work

1. Fabricate framework, including posts, pantographs, hinges, hinge plates, and rods from either extruded aluminum or ferrous metal. Arrange frames requiring pantographs for horizontal pantograph action with pantographs located at top and bottom of the frame. Provide pantographs spaced not over 4 feet apart. Provide intermediate pantograph at center of doors less than 8 feet high unless the door has vertical metal reinforcing. The pantographs shall operate smoothly with positive folding action and shall have a control device to prevent flattening of the folds when the panel is fully extended. Ferrous metal shall be either cadmium plated or zinc coated, except posts at the option of the door manufacturer shall have phosphate treatment and manufacturer's shop finish paint.

B. Suspension System

1. Provide a suspension system consisting of steel or aluminum track and trolleys designed to support the weight of the partition. Provide steel track 16 gage minimum, phosphate treated and finished, or zinc or cadmium coated. Provide extruded aluminum track with minimum thickness of 1/8 inch. Tracks may have an integral ceiling guard. Trolleys shall have at least two ball bearing nylon or steel tired wheels spaced according to manufacturer's design criteria and four at an end post.

C. Covering

1. Attach fabric to the framework with fasteners that permit easy removal of the cover but prevent sagging or separation. Position vertical seams in the bottoms of valleys and reinforce. Provide top and bottom edges of cover fabrics with ½ inch minimum turned hems.

D. Sound Insulation

1. Provide sound insulation as necessary to achieve the specified sound transmission class.

E. Air Release

1. Provide an air release system which will allow trapped air within the partition to be released during the stacking process.

F. Seals

1. Provide perimeter seals as necessary to produce the sound transmission class specified and to pass the visual test specified.

G. Hardware

1. Provide Hardware of the heavy-duty type standard with the manufacturer. Provide pulls and latches for all partitions. Provide partitions with keyed locks, privacy latches, magnetic contact latches, or foot bolts.

H. Accessories

1. Provide multiply meeting posts, rolling posts, switches, ceiling guards, recessed tracks, and curved tracks in accordance with design requirements.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Inspection

1. Check openings scheduled to receive accordion-folding partitions for correct dimensions.

2. Install partitions in accordance with the approved partition layouts, manufacturer's directions, and ASTM E 557. Structural support for the rack support elements shall be as indicated.

B. Electrical Operators

1. Conform electrical components and installation to the requirements of NFPA 70. Provide the partition manufacturer's standard drive and control components required to operate the partition properly. Power source is as indicated.

C. Adjustment

1. Adjust manually operated partitions to open and close from any position with a maximum horizontal force of 30 pounds applied to pendant pull, pox or handle. Adjust drive components and limit switches of electrically operated partitions to ensure the partitions operate properly upon activation of the control switch.

3.02 FIELD TEST

A. Operational Test:

1. Operate partition at least three times to demonstrate that partition is capable of being moved from the stored position to the fully extended position smoothly and quietly and without overloading the drive components. Activate the emergency release mechanism and demonstrate proper operation of the partition in the manual mode. Adjust partitions which do not operate properly and retest.

B. Visual Test

1. Conduct visual field tests for light leakage with all room lights turned on in the space on one side of the partition. Darken space on the other side of the partition. There shall be no light leakage from the lighted space to the darkened space. If light leakage does occur, adjust the partition to correct the problem and retest.

C. Acoustical Test

1. Field sound performance: Partition shall be tested by an independent certified acoustical consultant in accordance with ASTM E 336, and achieve a Noise Isolation Class (NIC) in

accordance with design requirements or minus two. Adjust and/or modify partitions which do not comply, and retest.

3.03 CLEANING

A. Clean any soiled parts of the partition in accordance with manufacturer's instructions.

END OF SECTION

General Notes

1. Partitions require a floor, end, and ceiling to avoid gaps that will lower the sound transmission class (STC) rating.

2. Provide a barrier in the ceiling space above the partition equal to the STC rating of the partition.

3. Large operable partition are difficult for manual operation. Provide electrical operation.

SECTION 10800
TOILET ACCESSORIES

PART 1 - GENERAL

1.01 WORK INCLUDES

A. Toilet accessories complete.

1.02 REFERENCE STANDARDS

A. American Society of Testing and Materials (ASTM)

1. ASTM C 1036 – Flat Glass

1.03 SUBMITTALS

A. Product Data

1. Manufacturer's descriptive data and catalog cuts indicating materials of construction, fasteners proposed for use for each type of wall construction, mounting instructions, operation instructions, and cleaning instructions.

B. Operation and Maintenance Data

1. Electric Hand Dryer

1.04 DELIVERY, HANDLING AND STORAGE

A. Toilet accessories shall be wrapped for shipment and storage, delivered to the jobsite in manufacturer's original packaging, and stored in a clean, dry area protected from construction damage and vandalism.

1.05 WARRANTY

A. Manufacturer's standard performance guarantees or warranties that extend beyond a 1 year period shall be provided.

PART 2 - PRODUCTS

2.01 MANUFACTURED UNITS

A. Toilet accessories shall be provided where indicated in accordance with paragraph schedule. Each accessory item shall be complete with the

necessary mounting plates and shall be of sturdy construction with corrosion resistant surface.

1. Anchors and Fasteners shall be capable of developing a restraining force commensurate with the strength of the accessory to be mounted and shall be suited for use with the supporting construction. Exposed fasteners shall have oval heads, be of damperproof design and shall be finished to match the accessory.

B. Finishes

1. Except where noted otherwise, finishes on metal shall be stainless steel with No. 4 satin finish and carbon steel, copper alloy with chromium plated, bright and brass.

2.02 ACCESSORY ITEMS

Drawings shall show location, widths and heights, and vertical height above finished floor, as required, for accessory items.

A. Facial Tissue Dispensers shall be surface or recessed mounted, Type 304 stainless steel face, satin finish on bright polished finish. Face of recessed dispenser shall be secured by friction with suitable spring steel clips. Dispenser shall have a minimum capacity of 300 two-ply tissues.

B. Grab Bars shall be 18 gauge, 1-1/4 inches OD Type 304 stainless steel. Grab bar shall be form and length as indicated. Concealed mounting flange shall have mounting holes concealed. Grab bar shall have peened non-slip surface. Installed bars shall be capable of withstanding a 500 pound vertical load without deflection or movement from the fastenings. Space between wall and grab bar shall be 1-1/2 inch.

C. Glass for mirrors shall be Type transparent flat type, Class 1-clear. Glazing Quality ¼ inch thick conforming to ASTM C 1036. Glass shall be coated on one surface with silver coating, copper protective coating, and mirror backing paint. Silver coating shall be highly adhesive pure silver coating of a thickness which shall provide reflectivity of 83 percent or more of incident light when viewed through ¼ inch thick glass, and shall be free of pinholes or other defects. Copper protective coating shall be pure bright reflective copper, homogeneous without sludge, pinholes or other defects, and shall be of proper thickness to prevent “adhesion pull” by mirror backing paint. Mirror backing paint shall consist of two coats of special scratch and abrasion-resistant paint and shall be baked in uniform

thickness to provide a protection for silver and copper coatings which will permit normal cutting and edge fabrication.

D. Metal Mirrors shall be bright polished stainless steel, mirror quality, 0.037 inch minimum thickness, edges turned back ¼ inch and recess fitted with tempered hardboard backing, and theft-proof fasteners. Size shall be in accordance with paragraph schedule.

E. Paper Towel Dispenser shall be constructed of not less than 22 gauge carbon steel 0.269 inch, type 304 stainless steel, and shall be surface or recessed mounted. Dispenser shall have a towel compartment. Locking mechanism shall be concealed tumbler key lock.

F. Combination Paper Towel Dispenser/Waste Receptacle Units shall be recessed and shall have a capacity of 400 sheets of C-fold, single-fold, or quarter-fold towel. Waste receptacle shall be designed to be locked in unit and removable for service. Locking mechanism shall be tumbler key lock. Waste receptacle shall have a capacity of 18 gallons. Unit shall be fabricated of not less than 0.30 inch stainless steel welded construction with all exposed surfaces having a satin finish. Waste receptacle that accepts reusable liner standard for unit manufacturer shall be provided.

G. Sanitary Napkin Disposal shall be constructed of Type 304 stainless steel with removable leak-proof receptacle for disposable liners. Fifty disposable liners of the type standard with the manufacturer shall be provided. Receptacle shall be retained in cabinet by tumbler lock. Disposer shall be provided with a door for inserting disposed napkins, and shall be recessed, partition mounted, or surface mounted.

H. Sanitary Napkin and Tampon Dispenser shall be surface mounted, recessed. Dispenser, including door shall be Type 304 stainless steel and shall dispense both napkins and tampons with a minimum capacity of 20 each. Dispensing mechanism shall be for coin operation. Coin mechanisms shall have minimum denominations of 10 cents, 25 cent, 50 cents. Doors shall be und with a full-length corrosion-resistant steel piano hinge and secured with a tumbler lock. Keys for coin box shall be different from the door keys.

I. Soap Dispenser shall be surface mounted, liquid type consisting of a vertical Type 304 stainless steel tank with holding capacity of 1.2 L 40 fluid ounces with a corrosion-resistant all-purpose valve that dispenses liquid soaps, lotions, detergents and antiseptic soaps, surface mounted, powder type constructed of stainless steel or chromium plated zinc die casting, shall contain a swap feed mechanism and an agitator designed to

break up powdered soap, and shall have a minimum capacity of 0.94 L 32 ounces, lavatory mounted, liquid type consisting of a polyethylene tank with a minimum 0.94 L 32 fluid ounces holding capacity and a 4 inch spout length.

J. Light Duty Metal Shelves shall be supported between brackets or on brackets. Brackets shall prevent lateral movement of the shelf. Shelf shall be 18 inches long. Shelf and brackets shall be stainless steel.

K. Toilet Tissue Dispenser shall be surface mounted or recess mounted with two rolls of standard tissue, stacked vertically. Cabinet shall be carbon steel, bright chromium plated finish or stainless steel, satin finish.

L. Electric hand dryer shall be wall mounted and shall be designed to operate with a heating element core rating of not more than 2,100 watts. Dryer housing shall be of single piece construction and shall be chrome plated steel or baked electrostatically applied epoxy.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Surfaces of fastening devices exposed after installation shall have the same finish as the attached accessory. Exposed screw heads shall be oval. Install accessories at the location and height indicated. Protect exposed surfaces of accessories with strippable plastic or by other means until the installation is accepted. After acceptance of accessories, remove and dispose of strippable plastic protection. Coordinate accessory manufacturer's mounting details with other trades as their work progresses. Brackets, plates, anchoring devices and similar items used for mounting accessories in showers shall be bedded in a silicone or polysulphide sealant, as they are set to provide a watertight installation. After installation, thoroughly clean exposed surfaces and restore damaged work to its original condition or replace with new work.

B. Recessed Accessories: Fasten accessories with wood screws to studs, blocking or rough frame in wood construction. Set anchors in mortar in masonry construction. Fasten to metal studs or framing with sheet metal screws in metal construction.

C. Surface Mounted Accessories: Mount on concealed backplates, unless specified otherwise. Accessories without backplates shall have concealed fasteners. Unless indicated or specified otherwise, install accessories with sheet metal screws or wood screws in lead-lined braided jute, Teflon or

neoprene sleeves, or lead expansion shields, or with toggle bolts or other approved fasteners as required by the construction. Install backplates in the same manner, or provide with lugs or anchors set in mortar, as required by the construction. Fasten accessories mounted on gypsum board and plaster walls without solid backing into the metal or wood studs or to solid wood blocking secured between wood studs, or to metal backplates secured to metal studs.

3.02 CLEANING

A. Material shall be cleaned in accordance with manufacturer's recommendations. Alkaline or abrasive agents shall not be used. Precaution shall be taken to avoid scratching or marring of surfaces.

3.03 SCHEDULE (In accordance with design requirements).

END OF SECTION

General Notes

1. Tamperproof fasteners shall be provided for all exposed fasteners.

2. Through bolting of accessories should be considered for accessories.

SECTION 12320
CABINETS AND COUNTERTOPS

PART 1 - GENERAL

1.01 WORK INCLUDES

A. Base Cabinets

B. Wall Cabinets

C. Countertops and Backsplash

1.02 REFERENCE STANDARDS

A. American National Standards Institute (ANSI)

1. ANSI Z124.3 – American National Standard for Plastic Lavatories.

B. American Society of Testing and Materials (ASTM)

1. ASTM D 570 – Water Absorption of Plastics.

2. ASTM D 638 – Tensile Properties of Plastics.

3. ASTM D 2583 – Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.

4. ASTM E 84 – Surface Burning Characteristics of Building Materials.

C. Builders Hardware Manufacturer's Association (BHMA)

1. BHMA A 156.9 – Cabinet Hardware.

D. Kitchen Cabinet Manufacturer's Association (KCMA)

1. KCMA A 161.1 – Performance & Construction Standards for Kitchen and Vanity Cabinets.

E. National Electrical Manufacturer's Association (NEMA)

1. NEMA LD 3 – High-Pressure Decorative Laminates.

1.03 DESIGN

A. Cabinets shall be wood, factory-fabricated and finished in the manufacturer's standard sizes and finishes of the type, design, and configuration indicated. Cabinets shall be constructed as specified and shall meet the requirements of KCMA A 161.1. Wall and base cabinet assemblies shall consist of individual units joined into continuous sections. Fastenings shall be accomplished to permit removal and replacement of individual units without affecting the remainder of the installation. Counters shall be provided with watertight sink rim when indicated. Drawers shall be removable and shall be equipped with position stops to avoid accidental complete withdrawals. Shelves shall be fixed or adjustable as indicated.

1.04 SUBMITTALS

A. Shop Drawings showing each type of cabinet and related item, and clearly indicating the complete plan, location, and elevations of the cabinets and accessories and pertinent details of construction, fabrication, and attachments.

B. Product Data including catalog cuts, installation and cleaning instructions.

C. Test Reports certifying that all cabinets comply with the requirements of KCMA A 161.1. Tests shall be conducted by independent laboratories approved by KCMA. KCMA certification seals affixed to the cabinets will be accepted in lieu of certified test reports.

1.05 DELIVERY AND STORAGE

A. Cabinets shall be delivered to the jobsite wrapped in a protective covering. Cabinets shall be stored in accordance with manufacturer's recommendations in an adequately ventilated, dry location that is free of dust, water, or other contaminants and in a manner to permit access for inspection and handling. Cabinets shall be handled carefully to prevent damage to the surfaces. Damaged items that cannot be restored to like-new condition shall be replaced.

PART 2 - PRODUCTS

2.01 CABINETS

A. Wall and base cabinets shall be of the same construction and same outside appearance. Door design shall be solid flush face, framed inset hardwood panels, for glass face from vendors standard styles. Corner cabinets shall

be equipped with notched shelving or full circle shelves as indicated. Shelves shall be fixed or fully adjustable as indicated. Adjustable shelves shall be capable or adjusting on approximately 3 inch increments. Shelves shall be supported by self-locking clips or wood dowels. Dowels shall be approximately 5/16 inch in diameter by 1-9/16 inches long. Dowels shall be inserted into borings for the shelf adjustments. Shelves shall be minimum ½ inch thick plywood or minimum ½ inch thick, 45 pound density particle board. Drawer fronts shall be hardwood plywood to match cabinet door construction, ¾ inch thick solid hardwood frame with hardwood plywood panel.

B. Frame Type Cabinets shall be constructed with frame fronts and solid ends, or frame construction throughout. Frame members shall be ¾ inch thick by 1-1/2 inch wide; kiln-dried hardwood, glued together, and shall be either mortised and tenoned, dovetailed or doweled, nailed, stapled or screwed. Top and bottom corners shall be braced with either hardwood blocks that are glued together with water resistant glue and nailed in place, or metal or plastic corner braces. Backs or wall cabinets shall be 1/8 inch thick plywood. Backs of base and tall cabinets shall be 3/8 inch thick hardwood. Bottoms of cabinets shall be minimum 3/8 inch thick plywood and shall be braced with wood members glued in place. Cabinet ends shall be 5/8 inch thick hardwood plywood

2.02 COUNTERTOPS AND BACKSPLASH

A. High-Pressure Laminated Plastic Clad Countertops shall be constructed of ¾ inch thick, 45 pound density particle board core, and shall be post formed cove type, or fully formed type. Cove type shall be a single unit with self-edging and plastic laminate coved at the juncture of the countertop and backsplash. Fully formed type or square edge shall be a unit with shaped edges using wood nose molding at counter edge and shall include a separate backsplash. Backsplash shall be not less than 3-1/2 inches high. Edging and trim shall consist of plastic laminate cut and fitted to all exposed edges. End splashes constructed of ¾ inch plywood or ¾ inch thick, 45 pound density particle board core shall be supplied. Joints in surface sheeting shall be tight and flush and held to a practicable minimum. When the countertop and backsplash are two separate units, GP50 plastic laminate shall be used. When the countertop and backsplash are one unit, PF42 plastic laminate shall be used. Plastic laminate shall conform to the requirements of NEMA LD 3 and plastic laminate adhesive shall be contact type applied to both surfaces. For fully formed and cove type countertops, the post-forming plastic laminate shall not be bent to a radius smaller than the limit recommended by the plastic manufacturer.

B. Solid Polymer Countertops shall be constructed with integral sink and lavatory. Material shall be ¾ inch thickness, cast, and filled nonporous solid surfacing composed of acrylic polymer, mineral fillers, and pigments. Superficial damage to a depth of 0.010 inch shall be repairable by sanding or polishing. Material shall comply with the following performance requirements.

1. Tensile Strength; 4,100 psi, when tested in accordance with ASTM D 638.

2. Hardness; Barcol Impressor 50 when tested in accordance with ASTM D 2583.

3. Flammability; rated Class I with a flame spread of 25 maximum and a smoke developed of 100 maximum when tested in accordance with ASTM E 84.

4. Boiling water resistance; no effect when tested in accordance with NEMA LD 3.

5. High temperature; no effect when tested in accordance with NEMA LD 3.

6. Liquid absorption; 0.06% maximum (24 hours) when tested in accordance with ASTM D 570.

7. Sanitation; National Sanitation Foundation approval for food contact in accordance with Standard 51 and approval for food area applications.

8. Impact resistance; no failure for ball drop when tested in accordance with NEMA LD 3.

2.03 FINISH

A. Cabinet Finish

Cabinets shall be provided with a factory-applied durable finish in accordance with KCMA A 161.1 requirements and of a type standard with the manufacturer. Natural finish wood doors, drawer fronts, and exposed cabinet sides shall be fabricated of wood which will be free of extreme color variations within each panel or between adjacent panels. Exposed exterior surfaces shall be hardwood or grade A-A hardwood veneer with

natural stain and sprayed on factory applied finish, or melamine plastic finish.

B. Melamine Laminated Interior Cabinet Finish

Plywood, particle board or tempered hardboard cabinet backs shall be finished with a melamine laminate on the exposed side. Particle board shelves shall be covered on both sides with a laminated melamine finish. Melamine laminate shall conform to the requirements of NEMA LD 3 and laminate adhesive shall be contact type applied to both surfaces.

C. Backer Sheets

Backer sheets of high pressure plastic laminate, shall conform to NEMA LD 3, Grade BK 20 and shall be applied to the underside of all core material.

2.04 HARDWARE

A. Hardware shall conform to BHMA A 156.9, shall be suitable for kitchen cabinet use, and shall include all miscellaneous hardware for a complete installation. Door hinges shall be self-closing type. Drawer runners shall have nylon rollers standard with the manufacturer. Hardware and fastenings for doors and drawers with particle board cores shall be of the through-bolt type. The types and finishes of hardware shall be in accordance with design requirements.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Cabinets shall be installed level, plumb, and true to line, and shall be attached to the walls or floors with suitable devices to securely anchor each unit. Countertops, accessories, and hardware shall be installed as indicated on the drawings. Installation shall be in accordance with the manufacturer's approved printed instructions. The inner edge of sink cut-outs in laminated plastic tops shall be painted with a coat of semi-gloss enamel paint and sink flanges shall be set in a bed of sealant. Closer and filler strips and finish moldings shall be provided as required. Prior to final acceptance, doors shall be aligned, and hardware shall be adjusted.

3.02 CLEANING

A. Cabinet and countertop surfaces shall be cleaned in accordance with manufacturer's instructions.

END OF SECTION

2017 School Facility Design Criteria Manual

(This edition supersedes all previous or undated copies)

Plan Contacts

Mat-Su Borough School District
501 North Gulkana
Palmer, AK 99645
907-761-4000
www.matsuk12.us

Jim Estes
Director of Facilities
james.estes@matsuk12.us
Office: 907-864-2000

"School designs in K-12 education in the Mat-Su Borough must meet the needs of a continuing growing population while accommodating changing educational needs. Making the most of every dollar spent on school design and construction, schools and the District alike, look to fuse modern learning with modern tools. We want to ensure that our schools provide efficient and effective spaces for students and teacher collaboration and interaction. School design is about meeting the needs of our students—today and into their future."

Gene Stone, Superintendent

FACILITY DESIGN AND CONSTRUCTION CRITERIA MANUAL

MSB – Matanuska-Susitna Borough
MSBSD – Matanuska-Susitna Borough School District

Message to the Designers**:**

This document is intended to assist professional designers and tradesmen qualified in their specific field. It is not intended to replace good judgment, best construction practices or sound engineering principles. Rather, it is to list preferred types of materials and equipment and to identify those types that should be avoided based upon problems experienced on previous School District/Borough projects. There are standards outlined in this manual. Deviating from preferred products within each type listed should only be done after Designers have discussed proposed deviations with MSBSD Operations and Maintenance. When the manual clearly states “do not use” a specific product, it is unlikely that product would be accepted under any condition. However, the most important guideline in the selection of construction materials is the strict compliance with mandatory building codes and industry reference standards.

Users of this manual are invited to offer suggestions for improving the document. However, material suppliers should not take this as an invitation to seek District or Borough endorsement of their product or to have it included herein as a standard. Use of this standard does not relieve the design professional from adhering to engineering practices, applicable codes, etc. Where there is a conflict between the contents of this standard and applicable code that which is more stringent will take precedence. Direct all questions and comments to the MSBSD.

This edition supersedes all previous editions, specifically including undated copies. Please discard any outdated copies. To obtain a copy of the current edition please contact the MSBSD Operations and Maintenance Department at 864-2000.

Any designed deviation from this FDCM requires submission in writing by the designer with justification and approved by the MSBSD Director of Operations & Maintenance.

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LEED STATEMENT

Leadership in Environmental Energy Design (LEED) – The Matanuska-Susitna Borough School District, 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 (MSB Resolution Serial No. 07-137 and MSB Information Memorandum No. 07-310). It is understood that one or both concepts may or may not apply to every project. Designs will address each of these concepts separately, as supported by project budget.

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 in percentages, the cost increases and savings the MSBSD could expect in both the construction phase and in maintaining and operating the facility.

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 MSBSD'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 their 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.

MSBSD desires to have high performance school buildings that are consciously designed to have a long life with low environment impact. High performance schools join together the very best of today's design strategies and building technologies, as well as:

- Provide a healthy and comfortable indoor environment
- Conserve energy, resources, and water
- Functions as a teaching tool
- Serve as a community resource for neighborhood meetings and functions
- Ensure easy maintenance operation
- Create a safe and secure educational atmosphere
- Built to last with minimal repair

Also, high performance schools are cost-effective and help to protect the environment.

GENERAL PHILOSOPHY OF DESIGN

All school district facilities are public property and are normally obtained entirely at public expense. For this reason the district is obliged to endeavor to obtain facilities that provide maximum benefit to the public for the money expended. Schools, as public facilities, should be available to the public for any reasonable public purpose that does not impair the facility's use as a school. However, since construction funds for schools usually are appropriated specifically for educational purposes and state funding usually will be dedicated exclusively to meeting defined educational needs, these facilities must be designed as schools first and accommodation of other public purposes must be given secondary consideration only. Some public amenities, such as hockey rinks and other recreational facilities, are specifically disallowed from construction using state funds for schools.

One very important goal of the FDCM is to improve public health, safety and general welfare by enhancing the design and construction of buildings through the use of building concepts having a reduced negative impact or positive impact and encouraging sustainable construction plans. To obtain maximum benefit in a school facility the design must address the following:

Design Program: Does it meet the space and other functional requirements of the Educational Specification developed specifically for this project? Can the built environment be used as a context for learning?

Security: Does it provide a protected and defensible place for students, staff and public property?

Health: Does it provide a safe and healthy environment for students and staff?

Sustainability: Is sustainability integral to the entire project through skillful, sensitive and intuitive design applications adaptable a variety of demands with particular attention to USGCB's LEED certification requirements?

Energy Management- Are separate air and light systems being used to reduce utility consumption in unoccupied spaces outside of school hours?

Durability: Does it have appropriate materials, finishes and equipment to provide a long useful life?

Maintainability: Can the building be kept clean and in good repair without excessive maintenance costs or issues?

Cost Control: Are the design and materials free of extravagance? Likewise, materials having a high initial cost are acceptable provided there is appropriate compensation in the form of a long useful life, low maintenance or vandal resistance to justify the difference.

Design Quality Control: Is the design thoroughly reviewed by District and Borough 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 district.

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.

PLACE SITE Naming and numbering Here

Abbreviation List

AAC- State of Alaska Administrative Code

ADEC- Alaska Department of Energy Conservation

AHERA- Asbestos Hazard Emergency Response Act

AHJ- Authority Having Jurisdiction

ANSI- American National Standards Institute

ASHRAE- American Society of Heating, Refrigerating, and Air-Conditioning Engineers

BAS- Building Automation System

CMU- Concrete Masonry Unit

CQC- Contractor Quality Control

CPSC- Consumer Public Safety Council

CTE- Career Technical Education

DEC- Department of Environmental Conservation

DEED- Department of Education and Early Development

EIFS- Exterior Insulation and Finish Systems

FRP- Fiberglass Reinforced Plastic

GWB- Gypsum Wallboard

IPEMA- International Playground Equipment Manufacturers Association

MPR- Multipurpose Room

MSBSD- Matanuska-Susitna Borough School District

MSB- Matanuska-Susitna Borough

NBS- National Borough of Standards

NEC- National Electric Code

NFS- Non Frost Susceptible

NRCA- National Roofing Contractors Association

NSF- National Sanitation Foundation

O&M- Operation and Maintenance

RAR- Response Action Report

VAV- Variable Air Volume

VCT- Vinyl Composition Tile

Division 00- Procurement and Contracting Requirements

00 21 13 Instructions to Bidders

Part 1- General

1.01 General Bidding Requirements

A. Bidders are cautioned that mailed bids, which arrive after the time of the scheduled bid opening, will not be opened or considered. It is the Bidders sole responsibility to ensure that their bid is in the physical possession of the Purchasing Department prior to the scheduled time for the opening of the bid.

B. The submission of a bid shall be an admission that the Bidder has made such, examined the proposed works site and is satisfied as to the conditions to be encountered in performing the work and as to the requirements and accuracy of the Bid Documents.

C. Bidders shall notify the Purchasing Department promptly of any error, omission, or inconsistency that may be discovered during examination of the bid documents.

D. Use “lump sum” as basis of bidding to the maximum extent possible, unless special provisions are made on an individual project basis. Coordinate this with the MSBSD during the design development. Consider the use of “Best Value” as basis of bidding.

E. If additional work is anticipated but the scope cannot be clearly defined or if unit prices are required for some other specific reason, review project with MSBSD to determine best method of establishing unit pricing in specification.

F. If unit pricing is to be part of bid proposal, specify the length of time the unit pricing is to remain in effect.

G. Bids shall specify a price, typed or written in ink for each bid item called for. Bids may be rejected if they show any omissions, alteration of the forms, additions not called for, conditional or alternate bids not called for, qualified bids, or irregularities of any kind.

H. If additive alternates are to be a part of the bid proposal, specify length of time additive alternate pricing is to remain in effect.

I. Project documents (drawings and specifications) are to be provided to the MSBSD in both paper and electronic format. Coordinate exact numbers of each with the MSBSD during the design process.

J. Prior to the final selection, Bidders may be required to submit additional information, which the MSBSD may deem necessary to further evaluate the bids.

K. The MSBSD reserves the right to make investigations of the qualifications of the Bidder as it deems appropriate, including but not limited to, a background investigation conducted by proper authorities.

L. The MSBSD may, from time to time, require modifications in the Scope of Services to be performed under this Agreement. However, it is expressly understood that this Agreement shall not under any circumstances be modified without written authorization

from the MSBSD. All modifications in the terms of this Agreement shall be incorporated by written amendments to this Agreement executed by both parties.

M. The selected Bidder shall not delegate duties or otherwise subcontract work or services under any agreement without prior written approval of the MSBSD.

N. The MSBSD may terminate any awarded contract of Agreement at any time by serving written notice to the selected Bidder of such termination and specifying the effective date of termination at least ten (10) days prior to the effective date of termination.

O. This Invitation to Bid and the resulting bids received, together with copies of all documents pertaining to the award of a contract, will be kept by the Purchasing Department and made a part of the record which will be open to public inspection, unless restricted by the Bidder and/or School Board Policy. If a bid contains any information which is proprietary or confidential, each page of the bid must be clearly marked. Cost or price information will be open to public inspection after award of bid.

P. The MSBSD is exempt from Federal Excise Taxes. Exemption Certificate will be furnished when required.

Q. The successful Bidder shall procure and maintain minimum insurance requirements and shall provide proof of coverage to the MSBSD upon award of any agreement. Failure to furnish proper evidence of insurance, or the lapse of insurance required under the provisions of the agreement, may be ground for termination.

R. It is highly recommended that Bidders confer with their respective insurance companies or brokers to determine if their insurance program complies with the MSBSD's insurance requirements.

S. All individuals or businesses conducting business within the State of Alaska and within the Mat-Su Borough are hereby advised that they must obtain both a State of Alaska and a Mat-Su Borough business license.

T. Bids may be withdrawn upon written request delivered to the MSBSD Purchasing Department prior to the time specified for submittal of bids. However, no Bidder shall withdraw or cancel his/her bid for a period of ninety (90) days after said advertised closing time for the receipt of bids, nor shall the selected Bidder withdraw, cancel or modify their bid after having been notified by the Purchasing Department that said bid has been accepted by the MSBSD.

Division 01- General Requirements

01 10 00 Summary

Part 1- General

1.01 General Summary

A. Must have a clearly defined scope of project and work limits must be provided.

B. Comply with all current laws, rules and regulations of State of Alaska Administrative Code for all MSBSD designs. Only those codes formally adopted or codified are mandatory. The following contains requirements applicable to MSBSD construction work:

1. Building Code (IBC/UBC)
2. Fire Code (NFPA)
3. Electrical Code (NEC)
4. Mechanical Code (IMC)
5. Plumbing Code (UPC)
6. International Energy Conservation Code (IECC)
7. Energy Standard for Buildings current (ASHRAE 90.1)
8. Underwriters Laboratory, Inc. (UL) or approved equal (as referenced)
9. American National Standards Institute (ANSI) (as referenced)
10. American Society for Testing and Materials (ASTM) (as referenced)
11. Consumer Product Safety Commission (CPSC)
12. American with Disabilities Act of 1990 (ADA)
13. Department of Environmental Conservation (DEC)

C. In addition, if applicable, review the individual DEED project agreement for compliance with supplied list of potentially applicable statutes, codes, regulations, standards, and guidelines.

D. Designers will provide and review with MSBSD a list of appropriate governing agencies during schematic design phase. As directed by the Project Manager, designers shall review and obtain all permits and approvals for the project from appropriate state and local agencies, such as State of Alaska Department of Education and Early Development (DEED), State of Alaska Fire Marshal, State of Alaska Department of Environmental Conservation, Environmental Protection Agency and others as necessary in the course of the project development.

E. 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 “Notice to Proceed” to “Substantial Completion”.

F. Provide for coordination of MSBSD-furnished Contractor-installed items, such as blocking, inserts, templates, etc. Storage and staging of furnished equipment will be furnished by the MSBSD.

G. **Provide schedule of all proposed deviations unless otherwise noted in the FDCM with justifications for same. MSBSD has first right of refusal.**

H. Provide schedule of salvaged items and equipment.

I. 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.)

01 25 00 Substitution Procedures

Part 1- General

1.01 Substitution Guidelines

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

B. The Contractor is to submit any requests for substitutions on a “Request for Substitution” form which is included in the project specification. At a minimum, Contractor shall certify in the Request for Substitution that the proposed substitute product(s) will:

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

C. 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 written approval of MSBSD, who shall be the judge of quality and who may require Contractor to furnish additional data regarding a proposed substitute product.**

D. It is the responsibility of the Architect/Engineer to review all substitution requests and discuss the advantages and disadvantages of each with MSBSD. Where appropriate due to lower cost material or labor savings the substitution request shall include monetary credit to the project.

E. MSBSD in coordination with the proper department shall give the final approval of any substitute product.

F. The Architect/Engineer must review any/all changes in furnishings with MSBSD.

01 29 00 Payment Procedures

Part 1- General

1.01 Summary

A. Use of AIA documents G702 and G703 for pay requests and G703 for schedule of values is encouraged but not required. "Pay Requests" in a "Schedule of Values" format is preferred and must be approved by both Architect and MSBSD.

B. Pay Requests will not be approved if Certified Payroll as required by MSB's General Conditions is not current or if the project progress photos are not current.

01 31 19 Project Meetings

Part 1- General

1.01 Summary

A. Contractor shall submit as part of the mandatory preconstruction meeting requirements digital photos of the conditions before any work is performed. Photos shall document the condition of the project prior to any work being done and verify Contractor's acceptance of project's "as is condition".

B. A schedule for "on-site" construction progress meetings to review progress and discuss problems or items needing special coordination should be established. Frequency shall be a minimum of once per week.

C. Contractor shall submit as part of the mandatory preconstruction meeting requirements one (1) digital copy of the project prior to any work performed. These photos shall document the condition of the project prior to any work being done and verify Contractor's acceptance of project's "as is condition". Submit photos in digital format with appropriate documentation by the date determined at the preconstruction meeting but generally within one week of the preconstruction meeting.

D. Ongoing daily project photos are to be taken and submitted on a regular basis (weekly) at the on-site construction progress meetings. One (1) digital copy is to be submitted in digital format with appropriate documentation.

01 33 00 Submittal Procedures

Part 1- General

1.01 Required Submittals

A. Submittals shall include the following:

1. Provide complete product data that includes the following:

a. Manufacturer's technical data for all material and equipment at the system and sub system level

b. A system description including analysis and calculations used in sizing equipment. The description shall show how the equipment will operate as a system to meet the performance requirements. The following information shall be supplied as a minimum:

1. Description of site equipment and its configuration

2. Startup operations

2. Shop Drawings

3. O&M Manuals shall consist of the following:

a. Operators Manual

b. Maintenance Manual

4. As-Built Drawings after products are installed

5. Manufacturer's warranty on all products and equipment

01 41 13 Codes

Part 1- General

1.01 General Mechanical Codes

A. Comply with all current laws, rules and regulations of the State of Alaska Administrative Code (hereinafter referred to as AAC) for all MSBSD designs.

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

C. The following contain requirements applicable to MSBSD construction work:

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

2. National Fire Protection Association (NFPA)

3. International Fire Code (IFC)

4. International Mechanical Code (IMC)

5. International Building Code (IBC)

6. International Energy Conservation Code (IECC)

7. Energy Standard for Buildings current (ASHRAE 90.1)

8. General Safety Code (OSHA)

9. Uniform Plumbing Code (UPC)

10. Underwriters Laboratory, (UL) or approved equal
11. American National Standards Institute (ANSI)
12. American Society for Testing and Materials (ASTM)
13. Institute of Electrical and Electronics Engineers (IEEE)
14. Insulated Cable Engineers Association (ICEA)
15. National Electrical Manufacturers Association (NEMA)
16. EIA/TIA.606. Administration for the Telecommunications Infrastructure of Commercial Buildings
17. BICSI. Telecommunications Distribution Methods Manual
18. IEEE Standard 142
19. SMACNA. HVAC Duct Construction Standards, Metal and Flexible
20. SMACNA. Industrial Duct Construction Standards
21. SMACNA. Fire Damper Guide
22. NFPA Air Conditioning, Warm Air Heating, Air Cooling and Ventilating Systems, Pamphlet Nos. 90, 90A, 91, 96
23. State of Alaska Department of Labor, Mechanical Inspection Division
24. ASHRAE guide and SMACNA design guides are applicable for design and construction methods

1.02 Security Codes

A. The codes and regulations below form a part of the specifications for Security Management Systems. Work shall be performed in accordance with the applicable international, federal, state, and local codes or standards current at the commencement of installation. The following list summarizes applicable standards:

1. UL 294, “Access Control Systems Units”
2. UL 1076, “Proprietary Burglar Alarm Units and Systems”
3. FCC- Part 15 “Radio Frequency Devices”
4. FCC- Part 68 “Connection of Terminal Equipment to the Telephone Network”
5. NFPA 70, NEC

01 42 00 References

Part 1- General

1.01 School identification numbers are:

1-9, 101-109 High School

10-19, 110-119 Middle School

20-29, 120-129 Test/Network Management

30-59, 130-159 Elementary

60-69, 160-169 Charter

70-79, 170-179 Alternative

80-89, 180-189 Transition Sites (ie. Redington Jr/Sr)

90-99, 190-199 Administrative

01 43 13 Manufacturer Qualifications

Part 1- General

1.01 Requirements

A. The manufacturer shall be an established organization with referenced and documented experience in delivering and if applicable maintaining the product or service at equal or high sophistication than the project being bid on.

01 45 00 Quality Control

Part 1- General

1.01 Contractor Responsibilities

A. Contractor is responsible for Preparatory Phase meeting to review test requirements applicable to the work and project. Attendees are to include Contractor's CQC Manager and superintendent, Project Manager, architect/engineer, testing firm representative and subcontractors.

B. Contractor is responsible for obtaining all permits necessary for project completion.

C. Contractor is responsible for calling Special Inspector or testing firm for inspections. Notice shall be a minimum of 24 hours in advance. All reports shall be available at the next project meeting.

D. Contractor shall have approved plans and current construction documents, including redlines, on-site at all times, available for reference and clarification.

E. Contractor is responsible for retaining on-site copies of all tests and inspection records submitted by Special Inspector.

F. Contractor is responsible for coordination of inspections to avoid disruption of construction.

G. Contractor shall furnish all required lifts, labor, samples, and electrical power, fuel, etc., for testing and inspections.

H. Contractor is to report all test results including deficiencies, promptly to the architect and to the MSBSD Capital Planning / Construction Manager.

I. Coordinate with laboratory personnel to provide access to work.

J. Provide all preliminary mix designs proposed for all concrete work and other material mixes to the laboratory.

K. Repair test holes to match existing material and protect test samples.

L. Contractor is responsible for all retesting where results of required inspections, tests, or similar services prove unsatisfactory and do not indicate compliance with Contract Document requirements. The costs of retesting, construction, or replacement are the Contractor's responsibility.

M. Contractor shall obtain and pay for all incidental testing necessary to qualify materials for use in the work. This will include but is not limited to: material quality tests, mix design, equipment calibrations, plant calibrations, optimum moisture and maximum density curves and other similar tests as required to qualify materials for compliance with specified standards for field control tests. Contractor's inspection service providers must be qualified / certified.

N. Contractor shall coordinate with Project Manager and/or Engineer/Architect for testing schedules and submit all test results weekly.

O. O & M training for all equipment shall be provided by the Contractor.

P. Contractor's Quality Control submittals shall include:

1. Name and qualifications of CQC Manager
2. Quality Control Plan
3. Submittal log with division, paragraph, line item specified
4. Testing Agencies Qualifications
5. Planned schedule of tests and inspections
6. Test reports
7. Permits, licenses and certificates as required by MSBSD to establish compliance with standards and regulations of the project specifications

1.02 Quality Control Plan

A. Within 14 days of Contractor's receipt of Notice to Proceed Contractor shall submit the proposed Contractor Quality Control (CQC) Plan to designated Mat Su Borough representative. This plan shall identify personnel, procedures, control, instructions, tests, records, and forms to be used.

B. At a minimum the CQC Plan shall include the following:

1. Description of quality control organization, including name, qualifications, duties, responsibilities, and authorities of each person assigned a CQC function, including the CQC manager.
2. Control, verification, and acceptance testing procedures for each specific test.
3. Procedures for tracking preparatory and follow-up control phases.
4. Procedures for verification and acceptance tests, including documentation.
5. Procedures for tracking construction deficiencies from identification through acceptable corrective action including the verification process of corrected deficiencies.
6. Contractor shall maintain records on-site showing quality control activities are being performed.
7. Sample of daily CQC report chronicling project progress including as a minimum the following:
    a. Contractor/ subcontractor areas of responsibility
    b. Operating equipment hours
    c. Location and description of work and number of tradesmen
    d. Test and control activities
    e. Materials received on the site
    f. Instructions given, received, and conflicts in plans or specifications
    g. Other remarks impacting quality control or progress
    h. Verification or certification statement
    i. Outside weather conditions and building interior conditions
8. A report covering the above items shall be either sent to the Project Manager or available on-site before noon of the next work day.
9. A definable feature of work is a task which is separate and distinct from other tasks, has separate control requirements, and may be identified by different trades or disciplines or it may be work by the same trade in a different environment. Although each section of the specifications may generally be considered as a definable feature of work, there is frequently more than one definable feature under a particular section.

1.03 Quality Control Organization – CQC Manager

A. Contractor shall identify a CQC Manager who shall be overall manager of CQC and have Contractor authority in all CQC matters.

B. The CQC Manager should have a minimum of ten (10) years in construction and three (3) years in quality control management or construction inspection, preferably some quality control training as offered by Association of Contractors.

C. The CQC manager will be on-site at all times when construction is being done by the Contractor and/or sub-contractors.

1.04 Control

A. Contractor Quality Control is the means by which the Contractor ensures all construction work and materials supplied complies with contract requirements.

B. At least two phases of control shall be conducted by the CQC Manager for each definable feature of work as follows:

1. Preparatory Phase

This phase shall be performed prior to beginning work on each Definable Feature of Work; after all required plans/documents/materials are approved, and after copies are at the work site. It will be attended by the MSBSD, Architect, the Contractor and principal sub-contractor. The MSBSD shall be notified at least 48 hours in advance of beginning the preparatory control phase. This phase shall include a meeting conducted by the CQC Manager and attended by the Superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. The results of the preparatory phase actions shall be prepared by the CQC Manager and attached to the daily CQC report. The Contractor shall instruct applicable workers as to the acceptable level of workmanship required in order to meet contract specifications. This phase shall include:

a. A review of applicable specifications, reference codes and standards, copies of which will be maintained on the job site until final acceptance of the work

b. A review of the contract drawings and all changes that have occurred throughout the construction process

c. A review to assure all materials and/or equipment have been tested, submitted, and approved

d. Review of provisions required for control inspection and testing

e. Examination of work area to assure all preliminary work is complete and in compliance with the contract

f. A physical examination of required materials, equipment and a “mock-up” sample to assure quality acceptance

g. Review of applicable procedures for controlling quality of the work

h. Review of applicable construction tolerances and workmanship standards

i. A review to ensure work to be performed has MSBSD approval

j. Discussion of the initial control phase.

2. Follow-up Phase

Daily checks to assure control activities including control testing are providing continued contract compliance. These checks shall be documented in the daily CQC

reports. Final follow-up checks shall be conducted and all deficiencies corrected prior to the start of additional features of work which may be affected by the deficient work. The Contractor shall not build upon nor conceal non-conforming work.

1.05 Testing and Inspection Services

A. The Contractor shall provide professional inspections, tests and similar services by certified agencies as required by the contract, specification requirements and governing authorities. Testing also includes operational, acceptance and commissioning tests, although these may be conducted by the factory or commissioning firm and in some cases by the contractor.

B. During the testing, the Contractor will:

1. Verify the testing procedure complies with contract requirements.

2. Verify the facilities and testing equipment are available and comply with testing standards.

a. Check for current calibration on instruments.

b. Verify that recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.

c. All network connections (both copper and optical) need to be tested after installation, and a copy of the certification results needs to be furnished to the MSBSD.

C. MSBSD reserves right to direct specific location or area of work to be tested in accordance with contract requirements.

D. Testing Laboratory Services

1. Qualifications of Laboratory

a. Independent laboratory approved by Architect or building official.

b. Meet “Recommended Requirements for Independent Laboratory Qualifications” latest edition published by American Council of Independent Laboratories.

c. Meet ASTM E-329 latest edition, “Standards of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel Used in Construction”.

d. Must have current engineer licensed in the State of Alaska to review tests and services.

2. Laboratories Duties

a. Ascertain and certify compliance with Contract Documents.

b. Promptly submit written inspection and test reports to Project Manager, Architect and Contractor within 48 hours of inspection.

c. Prepare and submit written reports include at a minimum the following:

1. Date of Issue

2. Project and title
3. Name and address of testing agency
4. Dates and locations of samples and tests
5. Names of individuals making tests and inspections
6. Description of work and test method
7. Identification of product and specification section
8. Complete inspection or test data
9. Test results and interpretation
10. Record of weather both inside and outside the test site
11. Comments or professional opinion on whether tested or inspected work complies with the contract specifications
12. Name and signature of the laboratory inspector
13. Recommendations on re-testing and re-inspection

d. Laboratory is not authorized to:

1. Release, revoke, alter, or enlarge on Contract Documents requirements
2. Approve or accept any portion of the work
3. Assume any duties of Contractor
4. Issue a stop work order

1.06 Observation

A. The following stages of construction specifically require observation by the Architect, Project Manager and utility or authority with jurisdiction. Contractor shall also provide digital images before and after each stage of construction listed below.

B. Stages requiring a minimum two (2) day advance notice for incremental parts:

1. Completion of trench excavation prior to placement of bedding
2. Completion of a utility prior to backfill
3. Completion of sub-drainage and underground piping
4. Completion of driveway, parking lot, sidewalk, etc., prior to installation of geo-textile fabric and prior to placement of pavement
5. Completion of excavations for footings and foundations
6. Completion of forming prior to concrete placement- verify rebar correctly installed and subgrade utilities and conduit etc. are correctly installed
7. Completion of masonry as damp proofing work is beginning
8. Wall framing and sheeting on one side of a wall

9. Mechanical and electrical rough-in
10. Insulation and vapor barrier installation prior to cover
11. Completion of mock-ups and finishes
12. Beginning of roofing

C. Stages requiring a minimum five (5) day advance notification:

1. Substantial completion
2. Operational Training
3. Final Completion

1.07 Completion Inspection

A. Contractor will prepare a “Punch List” inspection report near the scheduled end of the project. Deficiencies will have been corrected or a date for correction will be listed. After Contractor has completed this “Punch List” inspection the Contractor will notify MSBSD the project is ready for the substantial completion inspection.

B. MSBSD/ Project Manager will determine which deficiencies will need correction prior to award of Substantial Completion.

C. Prior to one year of operation there will be a warranty inspection to evaluate all building systems and components.

D. When applicable a DEC approved water test shall be pre-formed prior to the one year warranty expiration date.

1.08 Notification of Non-Compliance

A. MSBSD Project Manager will notify Contractor of any detected non-compliance with contract requirements. Contractor will take immediate corrective action upon receipt of such notice. Such notice when received at the job site is sufficient for Notification of Non-Compliance. If Contractor fails or refuses to address Non-Compliance, the Project Manager may issue a stop work order for all or part of the work until satisfactory corrective action has been taken. No time, costs or damages associated with such stop orders can be part of a claim for extension of time or for excess costs or damages by Contractor.

B. Non-Compliance notices must have follow-up release notifications from the MSBSD or Architect as part of the CQC record documents.

01 50 00 Temporary Facilities and Controls

Part 1- General

1.01 Temporary Facilities and Controls Requirements

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 MSBSD will assume all utility costs after the date of substantial completion for the phase of the project which has been completed.

C. Architect to review design in regards to extent and location of construction barriers, areas for materials storage and areas to be utilized for construction staging. The Architect will review the proposal with the MSBSD. Specify types of barriers and provide details for construction as required.

D. Contractor shall be responsible for their own on-site security both during and after hours of all construction projects. Upon request the MSBSD will provide the Contractor with keys as required.

E. The Architect is to review the design with the MSBSD and make provisions in the drawings and specifications which outline the extent of noise and dust control barriers which are to be provided, if any.

F. During times when school is in session, the facility will function during the normal established hours for school. School functions shall have priority use of existing facilities unless provisions are made and agreed to by MSBSD. Architect shall coordinate with MSBSD and will provide an outline of acceptable work hours in the specification for Contractor construction in progress during the school year. Contractor shall make necessary accommodations in work schedule so as not to interfere in normal school routine.

G. Specifications shall note Contractor is responsible for ensuring all temporary power is to be installed in a code approved manner and shall be disconnected and removed from the site at completion of project.

H. Specifications should note Contractor is responsible for returning all areas utilized for construction purposes back to original condition at completion of project if these areas are not been covered elsewhere in construction documents.

01 77 00 Closeout Procedures

Part 1- General

1.01 Closeout Requirements

A. Specifications shall dictate the Contractor provide MSBSD with a set of construction drawings with all construction As-Built changes marked legibly. Drawings to include actual locations of major conduit runs, piping and underground utilities. Architect/Engineer shall deliver these record drawings with electronic copies and prints to MSBSD.

B. Based upon Contractor furnished markups the Architect/Engineer shall prepare and submit two (2) full sets of As-Built prints, one (1) ½ size set of prints, and three (3) digital copies of record drawings to MSBSD.

C. The Architect/Engineer is to provide a complete list of Operations and Maintenance requirements in one section of the specifications and is responsible for reviewing this list with the MSBSD prior to project bid.

D. Specifications shall require Contractor to submit two (2) copies of each Operations and Maintenance manual which at a minimum will include the following information:

1. Product data
2. Parts numbers and illustrations
3. Maintenance information to include the Operators and Service Manuals for all serviceable products and equipment installed
4. Preventative Maintenance schedule to include specific make, model and room location of equipment
5. Names and addresses of suppliers of replacement products
6. Special cleaning and care instructions for all finish materials
7. List of all spare parts which should be maintained on hand

E. Specifications shall require Contractor to coordinate with Architect, Owner and appropriate subcontractor(s) to provide MSBSD personnel training for all systems.

F. Specifications shall dictate all training seminars to be scheduled a minimum of two (2) weeks in advance. Operations and maintenance seminars shall include a thorough hands-on systems demonstration by the appropriate subcontractor. It is required that a video record and appropriate training material be provided to MSBSD Maintenance in electronic format for future reference.

G. Individual specifications may require the Contractor to fully test all systems to confirm the system is fully operational in accordance with the intent of the design.

H. The Contractor will neatly store, separate and identify all spare parts and maintenance materials required in other portions of the specifications. The Contractor will be responsible to turn these items over to the MSBSD at the end of the project.

I. All Punch List items shall be completed by project completion date. The Contractor shall ensure each item on the Punch List has been completed by providing Architect and MSBSD with a copy of the original Punch List on which each completed item on the punch list has noted as completed with a signature/initial and a date for re-inspection.

J. Provide final certification stating no asbestos materials were used in construction.

K. Provide all warranty information in the appropriate section of the Operations and Maintenance Manual. Warranties will include all individual product warranties and guarantees along with complete contact information for each individual vendor providing those products.

L. Contractor shall submit a complete set of photos that verify the completion of project scope. Submit photos in digital format with appropriate documentation.

Division 02- Existing Conditions

02 30 00 Subsurface Investigation

Part 1- General

1.01 Subsurface Investigation Requirements

A. The MSBSD will require the Architect/Engineer to furnish soils and survey data under third party services.

B. Site survey information will be included in contract documents. Note all pertinent existing utilities, buried tanks, wells, etc.

C. Soils Report or Geo-Tech Report shall be made available to bidders and contractors but not bound in bid documents.

02 41 13 Selective Site Demolition

Part 1- General

1.01 Non-Hazardous Materials

A. Contractor to coordinate all items to be demolished and salvaged with MSBSD, otherwise the Contractor is to remove and legally dispose of all demolished items off site.

B. Contractor will photograph entire project prior to demolition and submit a digital copy of photographs to MSBSD with appropriate documentation

1.02 Hazardous Materials

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

B. Contractor will supply MSBSD with letter of AHERA (Asbestos Hazard Emergency Response Act) compliance on all new construction. AHERA Exclusion Document requires the signature of either the architect or engineer of record.

C. Contractor will supply MSBSD with letter of verification on legal disposal and chain of custody documentation on all remodels (AHERA).

D. Contractor will supply MSBSD with letter of AHERA compliance on all renovations.

E. Response Action Report (RAR) is required for any construction project that disturbs asbestos. Supply MSBSD with RAR at completion of project.

Division 03- Concrete

03 30 00 Cast-In-Place Concrete

Part 1- General

1.01 Cast-In-Place Concrete Requirements

A. For concrete slabs on grade receiving membranes of any kind (wood flooring, liquid applied flooring, adhesive applied finish, etc.) specifications should call for independent testing immediately prior to and during the flooring installation. Tests shall include moisture content, slump, air entrainment, compressive strength, and alkalinity.

B. Provide compacted Non Frost Susceptible (NFS) fill to a minimum depth of 6' 0" below all loading docks and entry slabs to prevent heaving at doors.

C. Color, if used, in exposed concrete shall be integral. Paints or stains must be MSBSD approved.

D. Apply sealer to all exposed concrete as appropriate.

E. Use of foundation / footing drain(s) required.

F. Layout of sidewalks 8' width minimum should relate to actual paths people will walk as opposed to geometric figures or abstractions. All sidewalks will be edged with a minimum ¾" radius. Any sidewalks under 8' width must be approved by MSBSD rep.

03 35 00 Concrete Finishing

Part 1- General

1.01 Concrete Finishing Requirements

A. High traffic and loading dock areas shall have a broom concrete finish

B. Protection

1. Protect floor from any stains during the course of construction.

    a. All hydraulic powered equipment must be protected in such a manner to avoid staining the concrete.

    b. If it becomes necessary to complete the scope of work and a vehicle is required on the interior slab, drop cloths will be placed under vehicles at all time.

    c. No pipe cutting machine will be used on the inside floor slab without proper protection.

    d. Protect slab prior to placing steel to avoid rust staining.

    e. Avoid acids or acidic detergent contact with slab.

    f. General Contractor is required to inform all trades that the slab must be protected at all times.

C. Products

1. Basis of Design Concrete Hardening/Finishing System

a. Retro-Plate 99 manufactured by Advanced Floor Products, Inc. or MSBSD approved equal.

1. Performance Criteria must meet ASTM standards

b. Certified applicators to perform work is required

c. Manufacturer's regional representative must be consulted on all applications.

D. Surface Conditions: Examine substrate with installer present, for conditions affecting performance or finish. Correct conditions detrimental to timely and proper work. Do not proceed until unsatisfactory conditions are corrected.

E. Application

1. Sealing, Hardening and Polishing of Concrete Surface

a. Allow a minimum of 45 day curing time or a time as specified by the manufacturer prior to application of polishing/hardening system.

b. At a minimum, 10 days curing time post finish application before equipment is placed on finished floor.

c. Only a certified applicator shall apply the polishing/hardening system. Installer is required to follow installation guidelines and procedures as recommended by the product manufacturer and as required to match approved test sample.

F. Protect finished work until fully cured in accordance with manufacturer's recommendations.

03 35 19 Colored Concrete Finishing

Part 1- General

1.01 General Requirements

A. Concrete coloring must be approved by MSBSD rep after request by designer, engineer or contractor.

Part 2- Products

2.01 Colored Concrete Products

A. Scofield product or MSBSD approved equal

Part 3- Execution

3.01 Application

A. Apply stain to concrete per manufacturer recommendation only after concrete has cured for the timeframe recommended by the manufacturer of the product and as required for the specific color.

B. Score decorative jointing in concrete surfaces before staining.

C. Application of Sealer:

   1. Utilize sealer recommended by the stain manufacturer.

   2. Apply sealer according to manufacturer's instructions.

D. Protect finished work until accepted by MSBSD in accordance with manufacturer's recommendations.

Division 04- Masonry

04 20 00 Unit Masonry

Part 1- General

1.01 Masonry Requirements

A. Raked joints in CMU walls are not permitted.

B. Joints exposed to view should have 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.

C. 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. Do not start CMU course 1/2 module from finish floor.

D. Current ASCE 5, ASTM and IBC seismic standards must be followed.

E. ASTM C270 Mortar standards shall be used.

F. ASTM C476 grout standards must be used.

G. Ensure appropriate sealer is applied to both sides of all exposed masonry as appropriate.

RE-BAR Specs?

Division 05- Metals

05 10 00 Structural Steel

Part 1- General

1.01 Framing Requirements

A. Review Quality Assurance and Control requirements per ASTM standards for inspections and/or certifications required by the International Building Code (IBC).

B. Specify individual certifications to be submitted for all on-site welders.

C. MSBSD requires a summary of all special inspections to be completed describing how each structural weld and bolted connection is to be inspected, tested and documented.

D. Each structural connection, (i.e. bolt / weld) will receive an inspection.

05 14 00 Structural Metal Stud Framing

Part 1- General

1.01 Framing Requirements

A. Minimum 18 gauge studs to be used

B. Maximum spacing 16” on center and maximum height of fire blocking to be 10’ from finish floor

C. Bridging of studs at maximum of 10’ height

05 50 00 Metal Fabrications

Part 1- General

1.01 Handrails

A. Clear anodized aluminum or stainless steel is preferred system.

B. Unpainted hot-dipped galvanized coated exterior railings will be considered with MSBSD approval.

C. If steel rails are used they must be powder coated and approved by MSBSD

05 53 00 Metal Gratings

Part 1- General (Possible Removal of spec completely)

1.01 Gratings

A. Require that anti-slip stainless steel or galvanized metal grates are placed outside main entrances.

B. Install grating on exterior side of entry doors, 6" from door and centered on the door.

C. Maximum space size no greater than ½-inch, but avoid very tightly spaced grates which get very slippery.

D. Entry grates must be removable and designed in panels less than 50 pounds each.

E. Specify tolerances to help avoid accidental injuries.

F. Grates to comply with the Americans with Disabilities Act (ADA) Standards for Accessible Design 2011 of latest edition.

05 55 00 Metal Stair Treads and Nosing's

Part 1- General

1.01 Stair Treads and Nosing's

A. Provide abrasive coated anchored or cast-in place nosing's at interior concrete stairs where specified finish is exposed concrete. Treads and Nosing's must meet current ADA requirements.

B. Anti-slip patterned rubber treads are required stair finish at interior occupied spaces unless alternate is approved by MSBSD.

Division 06- Wood, Plastics, Composites

06 10 00 Rough Carpentry

Part 1- General

1.01 Rough Carpentry Requirements

A. Specifications shall make provisions for backing for all wall mounted items.

B. There should be a hardened minimum wall height of 8'.

C. Blocking shall be clearly noted on drawings and/or noted in specifications. This includes but is not limited to the following: handrails, grab bars, hooks, door stops, wall hung lavatories, toilets, peg boards, white boards, tack boards, and interactive boards, cabinets, gym equipment, toilet partitions, toilet accessories, drapes, wall-to-wall and wall-to-ceiling intersections to support sheetrock and projection screens.

06 20 00 Finish Carpentry

Part 1- General

1.01 Trim

A. Provide resilient base in gym, physical education room and dressing rooms except where tile occurs. Resilient base needs to be appropriate for the type of floor system.

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

06 60 00 Plastic Fabrications

Part 1- General

1.01 Plastic Laminate

A. Plastic laminates, Fiberglass Reinforced Plastic (FRP) may be used in areas such as custodial closets with mop sinks, kitchens, restrooms and showers.

B. Draw and specify moisture resistant MDF, or concrete board for backing of plastic laminates in wet locations. Particle board is not allowed.

C. Plastic laminate over wood or other porous substances is not acceptable for science classrooms or prep rooms. Use solid, homogeneous, synthetic material appropriate to this application.

D. Assembly techniques are to effectively seal joints most likely to be exposed to water, such as around sinks.

E. ADD SCIENCE LAB COUNTERTOP SPEC

F. ADD Solid Surface Countertop Spec

Division 07- Thermal and Moisture Protection

07 10 00 Damp Proofing and Waterproofing

Part 1- General

1.01 Waterproofing Requirements

A. Under-slab vapor barrier is required such as poured athletic flooring, sheet goods, impervious carpet backing, etc. Install 10 mil vapor barrier directly under concrete slab. Review this requirement with each job based on current energy recommendations and research.

B. Damp proofing is required at all exterior foundation walls.

C. Waterproofing is required if one or more of the following conditions are present:

1. Building has a basement and native soils that do not drain well.
2. Site has a high water table.
3. Site is poorly drained.

4. all foundation walls where adjacent interior floor is below ground

D. A weather barrier (i.e. Tyvek or other building paper) is required to be placed directly under all siding materials. Use of Tyvek does not change exposure classification required for sheathing.

E. Provide specifications and drawing details for sealing of all seams and penetrations. Provide protection of vapor barrier from penetrations.

07 21 00 Insulation

Part 1- General

1.01 Insulation Requirements

A. In vented attic roofs installer to maintain minimum 3-inch airspace between top of insulation and bottom of roof sheathing or decking. Verify adequate passive ventilation. No power assisted fans.

B. Fiberglass batt insulation in metal stud walls must be full width between studs. Specifications should address proper insulation around conduit, wires, blocking, etc., in walls with attention paid to proper fit in corner of stud bays and at seams.

C. Specifications are to require the Contractor to notify Project Manager for an insulation and vapor barrier inspection in each area at least 24 hours in advance of wall covering installation.

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

E. Minimum R-21 at walls and minimum R-42 average at roof/ceiling assembly is required.

07 40 00 Roofing and Siding Panels

Part 1- General

1.01 Roofing- General Comments

A. All assemblies listed below shall have minimum 20 year warranty, 30 year preferred where applicable, with preference in order listed below.

1. Exposed PVC Membrane Roof Assembly – 60 mil minimum fully adhered, no exposed mechanical fasteners allowed

2. Exposed Membrane Roof Assembly – 75 mil reinforced EPDM, fully adhered, no exposed mechanical fasteners allowed

3. Preformed Metal Roofing Assembly

B. Shingles not allowed without MSBSD approval.

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

D. Minimum slope shall be 1/4" per foot except where roofing manufacturer requires greater slope for warranty.

E. Consider the effect of centrifugal forces on exhaust fumes or prevailing winds as related to roof curbs, proximity of exhaust sources and building intake vents.

F. Parapet Cap flashing to have drip edge on roof edge of flashing as well as exterior edge and be fastened with a cleat.

G. Provide roof ladders at locations greater than 5' roof height difference.

1.02 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/unloading zones, playgrounds, parking areas or other places frequented by pedestrian and 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 and approved by the MSBSD.

C. Specifications shall dictate 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 the actual application must be monitored in the field continuously by qualified personnel throughout the roofing process.

E. Pitched metal roofs shall be designed to either shed snow or to retain snow.

1. If the design intent is to shed snow from the roof then accommodation must be made to minimize or eliminate the potential of injury from sliding snow.

2. If the design intent is to retain 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.

1.03 Membrane Roofing

A. 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-inches above the membrane surface. Make sure all louvers, windows and other wall penetrations are at least 24-inches above top surface of roofing assembly including.

B. Locate roof drains at point of maximum deflection, mid-span if possible.

C. All roof drains and down spouts are required to be heated bowls.

D. Roof drains to terminate in one of the following methods:

1. Municipal storm drain system.
2. Dry wells with cleanouts per ADEC permit.
3. Daylight at remote location. Potential for drain line freeze up at daylight locations is probable; make provisions to heat trace the pipes.

E. 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 be thoroughly detailed and fully heat traced.
4. Details for scuppers and downspouts are to be reviewed by the MSBSD.

F. The use of scuppers as the primary means of draining a roof is 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 MSBSD
2. Thoroughly detail the scuppers and down spouts
3. Specify the installation of heat trace at all scuppers
4. Place scuppers at locations that will not be a maintenance dilemma for the MSBSD

G. Roof systems will have a 30 year guarantee/warranty with wind upload for zone/area of construction.

H. On projects with large areas requiring either a new roof or re-roof, specifications are to require a pre-roofing conference. Minimally, attendees are to include, the MSBSD, the Contractor, the Roofing Subcontractor, the Manufacturer's Representative, if at all possible, and any other person(s) the MSBSD, Architect, or Contractor deem necessary.

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

1.04 Roof Accessories

A. The use of skylights is prohibited.

B. Provide lockable roof access hatches with ladders inside the building.

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

D. Design clerestory windows so ventilation air or convection currents from adjacent radiation will pass across the glazing to prevent condensation and ice buildup.

07 46 00 Exterior Siding

Part 1- General

1.01 Exterior Siding Requirements

A. Use of wood siding is prohibited.

B. Synthetic materials must be checked for adequate installation. 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 reinforcement available.

C. EIFS (Exterior Insulation and Finish Systems) are generally not an acceptable wall finish system. EIFS may be considered provided the designer can demonstrate a sufficiently impact resistant finish is specified for the full height of walls.

D. Architect will verify building integrity envelope to acceptable standards by best method determined at the time of construction as soon as practical.

E. For all exterior siding materials specify materials previously used successfully in the MSBSD or conduct field tests to verify and demonstrate durability with specific attention to vandalism resistance before specifying.

F. All Material must be readily available in Alaska or the continental United States.

07 60 00 Flashing and Sheet Metal

Part 1- General

1.01 Sheet Metal Requirements

A. Parapet cap flashing with drip edges shall be designed to drain back onto the roof deck on low sloped roofs.

B. Be aware of parapet conditions where there is a sloped roof on one side and a pitched roof on the other side. Membrane must extend over parapet.

C. For sloped metal roofs, gutters are required over all pedestrian ways where water can be expected to drip from the building. Continuous gutter will be used. Examples are: entryways, garage doors, loading docks and sidewalks.

08 10 00 Doors and Frames

Part 1- General

1.01 General Comments

A. Typically draw and specify standard size doors throughout a design. If exterior doors require canopies there should be designed entryways to protect from corrosive conditions. Canopies less than 40" should be attached to building.

B. Keep door recesses to a minimum, especially at corridors into classrooms doors.

C. Door glazing is to be typically half height maximum, including entry doors. If the design warrants a large amount of glazing in a door it requires approval by MSBSD.

D. Provide glazing in all doors for the following uses:

1. Offices
2. Conference rooms
3. Classrooms
4. For collision prevention/blind traffic

E. Steel doors are preferred, do not specify or schedule aluminum, fiberglass or wood doors.

F. Require double doors with removable mullions for gym equipment storage room(s). Verify height and width of opening will handle the largest piece of equipment to be used or stored in the room.

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

H. Proprietary door systems not allowed.

I. Raceways for electrified door hardware shall be factory prepped whenever possible. Field prepped doors shall be recertified to maintain required ratings.

J. All doors should have locking mechanisms to provide security unless fire code prohibits.

08 12 00 Door Frames

Part 1- General

1.01 Interior Door Frames

A. Shall be steel, welded construction. Knock down or drywall type will not be accepted. Face joints shall be smooth finished.

B. Shall be minimum 16 gauge up to 36" opening. More than 36" shall be 14 gauge or heavier according to SDI-100 recommendations. See exception "Seclusion Room".

C. Wet locations shall be galvanized A60 or stainless steel, kitchens, restrooms, lockers and custodial closets for example.

D. Minimize GWB cracking above door frames by incorporating side lights and windows.

1.02 Exterior Door Frames

A. Shall be galvanized A60 or stainless steel, fully welded construction, knock down or drywall type will not be accepted. Face joints shall be smooth finished and include thermal breaks.

B. Shall be minimum 14 gauge or heavier according to SDI-100 recommendations.

C. Aluminum frames prohibited.

08 13 00 Metal Doors

Part 1- General

1.01 Summary

A. Schedule metal fully welded galvanized doors/stainless exclusively at all public corridors and exits.

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

Part 2- Products

2.01 Door gauge and material:

A. Door to be handed, beveled edge construction

B. Interior door shall be minimum 16 gauge steel. Wet locations shall be galvanized A60 or stainless: kitchens, restrooms, lockers, and custodial closets for example. Exceptions see "Seclusion Room".

C. Exterior door shall be minimum 14 gauge steel, A60 galvanized or stainless steel, polyurethane insulated.

2.02 Required Parts

A. Provide key operated removable center mullion on exterior and corridor doors. No more than one removable mullion per bank of doors. Sheet metal mullions not allowed.

B. 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, beveled lock/latch edge, handed type doors and frames at all exterior and wet locations. No narrow stiles.

C. Provide full mortise continuous hinges on all oversize (over 36-inches) doors and at high frequency use entrances. Do not use aluminum geared type. Use barrel type stainless steel. See Section 08 71 00 Door Hardware.

D. Provide required fire rated doors in accordance with current NFPA codes.

08 14 00 Wood Doors

Part 1- General

1.01 Requirements

A. On new school projects wood doors are not acceptable due to a lack of resistance to abuse. Wood doors acceptable in some renovations by MSBSD approval only.

B. Specify additional wood back-up at specified points of attachment for butts, door closers and knobs.

08 30 00 Specialty Doors and Frames

Part 1- General

1.01 Handicap and ADA Doors and Power Operated Doors

A. Handicap operated doors that are primarily manually operated. Low energy, operates as a manual surface closer during close cycles or when non-powered. Opening force, non-powered, is similar to manual closer. Sequential operation when used in pairs.

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

C. Discuss options available for keying and locking overhead doors with the MSBSD. If it is determined the overhead door is to be lockable, key the lock into the MSBSD master key system. Verify the locking mechanism will be accessible. Use standard components. Do not allow field expedient or locally fabricated components.

D. Coordinate or require coordination of power operated doors with electrical design and work. Keyed switches for power operation are to be coordinated with MSBSD standard keying.

E. Power operated doors are to be designed with safety devices standard to the industry for the particular type of door. Supply manual operations in the event of power failure.

F. Specify polyurethane insulated overhead doors for exterior use and carefully detail heads and jambs to minimize heat loss. R ratings: 14.86 = 1 5/8” door and 17.5 = 2”

door. Specify 100,000 cycle springs, pneumatic safety bottom, 1" brush weather-strip, and Lexan thermal vision kits.

G. Use of swinging doors is preferred over side coiling doors or grills.

H. The use of pocket door/sliding doors prohibited by the MSBSD

I. The use of Dutch doors is prohibited. Designers are encouraged to solve the problem of partial access in other ways. Consider the use of overhead coiling counter doors if possible.

08 31 00 Access Doors and Panels

Part 1- General

1.01 Access Doors and Panels

A. To provide the degree of access required, 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 appropriate sized access doors and panels besides those shown on the drawings 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 and/or its access.

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

08 31 15.53 Security Access Doors and Frames

Part 1- General

1.01 Keyless Door Entry Access Control System

A. A keyless door entry system shall be installed to provide automated access control of selected exterior doors.

B. Access Control Function Description

1. Provides automated door unlocking function utilizing MSBSD approved software and hardware.

2. Funnels first entry and last exit through card access controlled doors

3. Provides record of access activity to audit compliance with policies and procedures

4. Provides capability to add, edit, and disable access rights via software commands in lieu of costly re-keying
5. Provides flexibility of door locking via software scheduling and ad-hoc software commands
6. Supports carrying of photo ID badge by Faculty and Staff
7. Automatic operator function does not allow access during lockdown, panic, and closed position on the open/close card reader in the front office.
8. All exterior doors will lock on fire alarm
9. Elevator operation function during fire alarm will operates to lower level only

C. Door Hardware Functional Description

1. Electrified locking door hardware is required to provide automated (not pre-scheduled) door unlocking function; main entry doors may be left unlocked during normal hours via manual card-unlock. Provide fail-secure on all devices.
2. To achieve unlock door handles use Von Duprin E996L Electrified Trim or MSBSD approved equal.
3. Electrified door hardware shall be installed at these doors in order to provide the automated door unlocking functionality. When the door is locked and an authorized access control card is presented in proximity to the card reader the door shall momentarily unlock and allow access.
4. Door alarm contacts provide status monitoring of open or closed position of door and are used to detect “Door Forced” alarms when the door is opened without the use of an authorized access control card.
5. Latchbolt monitoring devices(ex. VonDuprin LX) relays the dogging of the latchbolt position, and also senses travel in the egress direction to shunt “Door Forced” alarms

Part 2- Execution

2.01 Access Control

A. Card readers shall be installed at specific doors in order to provide the audit and entry funneling functions described above.

1. A card reader shall be installed at the main front entry doors of the School. These doors are the primary entry/exit for all persons entering the School.
2. A card reader may be installed at the Faculty, Staff employee entry door. These doors are the primary or secondary entry/exit for Faculty, Staff, and custodial personnel.
3. A card reader shall be installed at the loading dock entrance. These doors are the primary entry/exit for warehouse/nutrition, maintenance, and custodial personnel.
4. If a separate entry door exists for bus unloading/loading, a card reader shall be installed at this entrance.

5. Additional card readers per function/flow as designated by MSBSD.

B. The installation of electrified door hardware means that in addition to the normal automated door unlocking function these doors will be interfaced to the panic button or lock-down buttons to switch from an unlocked state to a locked state when the button is pressed. They may also be locked or unlocked through programming (ADA access), scheduling or ad-hoc software commands via the access control system.

C. Access controlled door locations will be where the Intrusion Alarm arming stations are installed. When the Intrusion Alarm is armed, entry through these designated doors will provide the timed period for the Intrusion Alarm to be disarmed. However, entry through any of the other building perimeter doors will instantly cause an alarm. In this way, even though Faculty and Staff retain mechanical keys for many doors such as playground re-entry doors and classroom doors, they are funneled through the card reader access controlled doors for first entry and last exit.

D. Typically the loading dock entry doors are the primary entry/exit for custodial personnel. Therefore it is the location where a custodial lighting circuit timer would be installed and activated.

E. Middle Schools and High Schools have a significantly higher number of doors as well as more diverse requirements for access control. However, the basic functionality described above would only have to be expanded by the number of card readers in order to designate controlled Faculty and Staff employee entry doors. This would funnel all other traffic to the entries designated to be unlocked during normal hours. These entries may then be interfaced to the panic button or lock-down buttons to switch from an unlocked state to a locked state when the access lock-down button is pressed.

F. The entries designated for ADA access must interface with the automatic operator actuators with the proper access.

G. Where doors are equipped with a card reader the access control system can display a “Door Held Open” alarm in order to provide notice that the door has been propped open past a certain set time.

H. Where doors should not be used except as emergency exits, local door alarms should be considered. These devices sound an audible alarm when the door is opened and may provide an alarm to the access control system if requested.

I. These access control monitoring capabilities may not result in a real-time response if the system is not actively monitored. But they provide an audit trail of activity, which may be used for useful statistical analysis as well as corroborated with the IP SECURITY CAMERA system recorded images.

08 34 00 Special Function Doors

Part 1- General

1.01 Recovery Room (Seclusion Room) Door, Frames and Hardware

A. Door

1. Shall be 14 gauge steel, SDI type N, narrow vision lite. 4” x 25” Lexan.
2. Mortise type door, no face prep, with mortise pocket blanked off.
3. Must be out swing from recovery room, push open to exit.
4. Reinforcing present for surface applied hardware.

B. Frame

1. Shall be 14 gauge steel welded construction with no side or transom lite.
2. Shall have American National Standards Institute (ANSI) strike prep but have blank installed.
3. Reinforcing present for surface applied hardware.

C. Hardware

1. Ball bearing hinges.
2. Recovery room side of door shall be smooth finish. No kick plates, push plates, door pulls, or sound seals on recovery room side.
3. If auto door bottom is desired, it must be mortised into bottom channel of door.
4. No door closer, mortise set or overhead stop allowed.
5. Use Trimco 1209HA or equivalent door floor stop. No wall stops.
6. Use Locknetics 490M x TJ90 1500 pound magnet mount on pull side of door.
7. Use Locknetics 623 style momentary button
8. Use single door pull Ives 8103-0 or equivalent, 1” round straight pull 10” on center.
9. Incorporate door magnet controls to fire alarm panel and security system.
10. No windows exterior or otherwise in Recovery Room.
11. 1200 lb Shear Magnet self-aligning magnet (SAM). 24” centered above finished floor

08 34 56 Security Gates

Part 1- General

1.01 Interior Roll-Down Gates

A. Interior roll-down gates will be installed to partition selected MSBSD facilities into zones to allow after-hours use of certain zones without allowing access to the entire facility.

B. Interior Roll-Down Gates Functional Description

1. Provide the means to partition and segment the building into multiple zones.

2. Allows after-hours use of a portion of a building without creating access to the entire interior of that building.

08 40 00 Entrances, Storefronts, and Curtain Walls

Part 1- General

1.01 Requirements

A. Do not design entry doors with glass in bottom half as per MSBSD requirements.

B. All frames are to be fully welded.

C. Provide reinforcement at door and frame for all surface applied hardware such as pulls, push bars, continuous hinges, etc. All door and frame reinforcement shall be large enough to accommodate all screw attachment points on all surface applied hardware. Minimum reinforcement standards to comply with ANSI/SDI A250.6.

D. Frame and door reinforcement for continuous hinges 12 gauge full length at attachment locations. Reinforcement to fill full depth of stop and/or face as required for application.

E. Utilize the heavy, top-mounted parallel arm style closer at entries. See Section 08 71 00 Door Hardware. Reinforce all doors with closers to permit machine screw attachment of closers. (No sex bolts or sheet metal screws.) All door and frame reinforcement shall be large enough to accommodate all closer arm screws. Closer arm with incorporated stop/holder prohibited. Use Glynn Johnson 90 Series in addition to closer.

F. Middle and High School entrances to athletic areas are to be designed as ultra-high abuse areas and all components should be as maintenance free as possible. See Section 08 71 00 Door Hardware for acceptable heavy duty hardware components.

G. Exterior doors shall have a minimum 3/8-inch with a maximum 1/2-inch clearance between the bottom of the door and the top of the finished threshold.

H. Building overhangs cannot exceed current Fire Codes at entrances unless designed with dry pipe sprinklers.

I. Utilize continuous stainless steel barrel type hinges at all entrance doors. Use continuous hinges at all high traffic and high frequency use locations such as gyms, libraries, locker rooms, hall doors and vestibule doors. See Section 08 71 00 Door Hardware.

J. Provide for extended time in years from acceptance warranties from both manufacturer and installer for glazed curtain and window wall systems.

K. Consider prevailing wind pattern during school design. Provide barrier to protect main entries from prevailing wind to prevent damage to doors and accumulation of drifting snow. All exterior doors to be equipped doors with closers to help control doors during extreme wind.

08 50 00 Windows

Part 1- General

1.01 Summary

A. Sliding windows are not acceptable and are not to be specified. Preferred operator type is awning. Casements are acceptable. Operable windows should be kept to a minimum of one per classroom.

B. In science rooms, provide a relite between chemical storage and lab to allow for line of sight observation.

C. Provide glazing between shop office and student work areas.

D. All glazing to be at least 36-inches above finish floor

E. Design with window walls must be preapproved by MSBSD.

F. Specify glazing systems where window glazing is easily removed and replaced. Size of window should be considered for replacement ease.

G. All thermo pane windows must have a non-conducting thermal spacer between the panes of glass, low e rating and energy efficient.

H. Minimize structural steel bracing overlap in classroom windows.

08 51 00 Metal Windows

Part 1- General

1.01 Summary

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

B. Metal windows are required to be thermally broken.

08 52 00 Wood Windows

Part 1- General

1.01 Summary

A. Use of wood windows is not desired.

B. Wood windows are to be either vinyl or metal coated.

C. Specifications must require wood used in fabrication of wood windows be treated with a preservative.

08 70 00 Hardware

Part 1- General

1.01 General Comments

A. Floor mounted door stops are generally not acceptable. Plunger foot operated with rubber shoe door stops not acceptable.

B. Closer mounted door stops are not acceptable. All doors must have some type of stop to protect walls and counter tops, other doors, etc.

C. Provide magnetic hold-open devices tied into the fire alarm and lock down system on all classroom doors, student educational spaces doors, multiple occupant bathrooms doors, hallway doors, gym doors, corridor, library doors, music doors, etc.

D. Provide keyed heavy duty magnetic hold-opens on toilet room doors and mid-corridor doors. See Door Hardware Specification Guide below.

E. Standard hardware finish shall be satin stainless steel at all exterior and wet locations. Dull chrome shall be used elsewhere.

F. Bottom shoe of mullions shall attach to interior floor slab vs. exterior and shall not be placed on top of threshold.

G. No drop plates allowed on door closer installations.

H. Panic device standard placement must be coordinated with window size.

I. Panic device not to be mounted over door window or visible from outside of door window.

J. Use of sound seals is generally not preferred and should be limited to very noisy locations only and separation of classroom to classroom.

K. Provide adequate blocking for all door hardware, including wall stops.

L. Installation of door closers must follow manufacturer's template instructions as it applies to each doors opening requirement. Door closer shall be mounted to meet ADA requirements where applicable.

08 71 00 Door Hardware

Part 1- Products

1.01 Door Hardware Specification Guide

Section	Products	As Specified	Acceptable Substitutions
A	Butts	Hager	Stanley, McKinney, Lawrence
B	Continuous Hinges	Markar	Ives, Stanley
C	Key Removable Mullion	Von Duprin	None
D	Key Switch	Locknetics	Von Duprin
E	Locksets and Cylinders	Schlage Grade 1	None
F	Exit Devices	Von Duprin	None
G	Door Closers	LCN	None
H	Kick & Mop Plates	Builders Brass Works	Quality, Tice, Signature Brass, Rockwood
I	Overhead Stop and Holders	Glynn-Johnson	ABH
J	Coordinators	Glynn-Johnson	Door Controls
J	Flush Bolts	Ives	Builders Brass Works
K	Wall and Floor Stops	Builders Brass Works	Quality, Rockwood
M	Key Cabinet	Telkee	Lund
O, P	Weatherstrip & Thresholds	Pemko	National Guard, Reese
12 30 00	Cabinet Locks	Schlage	Olympus

A. Butts

Acceptable Manufacturers: Hager, Stanley, Lawrence, McKinney or MSBSD approved.

Types:

1. Extra heavy four ball bearing butts – Classroom, office, closet doors to 36”.
2. Anchor Hinge – Doors with closers and surface mounted overhead stops
3. All butt hinges to be NRP (Non Removable Pin).
4. All exterior butt hinges to be stainless steel.

Sizes:

1 3/4” Exterior and vestibule doors. 5” x 4.1/2”

1 3/4” Interior doors up to and including 36-inches. 4.1/2” x 4.1/2”

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

B. Continuous Hinges

Acceptable Manufacturers: Markar, Stanley, Ives.

1. Provide continuous hinges on all oversize doors and all high frequency use doors.
2. Use barrel type, only stainless steel continuous hinges.
3. Do not use aluminum geared type.
4. Hinges must be Grade 1 and rated for 600 lbs. minimum.
5. Continuous hinge may not be electric transfer hinges.

C. Mullions

1. Manufacturer: Von Duprin
2. No wires in mullion.
3. Non key removable

a. 4954 not fire rated

b. 9954 fire rated

4. Key removable

a. KR 4954 not fire rated

b. KR 9954 fire rated

D. Electric Strikes

1. Surface mounted strike: HES 9600 24VDC, 630 finish
2. Mortise and Cylindrical Locksets: Von Duprin 6200 Series, 630 finish

E. Magnetic Hold Opens

1. 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.
2. Standard Duty 35 lb. minimum Magnetic Holders – Standard Locations

   Acceptable Manufacturers: LCN, 7840/7850 Series.

   No extensions on magnetic hold open.
3. Heavy Duty 400 lb. Magnetic Holders – high frequency use doors, such as public toilets, mid-corridor doors, and other selected locations

   Design needs to incorporate release of magnets by security and fire suppression systems.

   Acceptable Manufacturer: Architectural Builders Hardware 2500 series

   Acceptable Substitutions: As approved by MSBSD
4. Features Required:

   Minimum of 400# holding power -- required in Bathrooms

   Separate keyed release switch

   Acceptable Manufacturer: Locknetics 643.05, Von Duprin KS920

   Use District keying

   Acceptable Substitutions: As approved by MSBSD
5. Seclusion Room requires Locknetics 490M x TJ90 1500 lbs operated by Locknetics 623 button. 1200 lb Shear Magnet as specified in Seclusion Room specifications.

F. Mortise Locksets

Specify deadbolt function at exterior locations.

Acceptable Manufacturer: Schlage “L9000” series mortise

Escutcheons designation: 06L

(Escutcheons are to be cast. Wrought escutcheons are not acceptable.)

Acceptable Substitutions: None

Specified Finish 630

1. Typical classroom mortise function, L9050 with thumb turn, no indicator
2. Common doors between classrooms, L9082, double storage room
3. Public restrooms and locker rooms, L9070
4. Staff/single user restroom, L9456 with occupied/vacant indicator
5. Staff restroom in public space/hallway L9485 with occupied/vacant indicator. Schlage 30-008 FSIC Cylinder.

G. Exit Devices and Push Bars

Acceptable Manufacturer: Von Duprin

Acceptable Substitutions: None

Mount exit devices at standard height: 39 13/16“ AFF

No glass bead kits. Windows are not to interfere with or modify device mounting.

Use 98 series on classroom and instructional area doors with thumb turn and indicator

Types:

1. Exterior doors 98 series rim with dead latchingss0200 function, night latch, with allen wrench dogging
2. Single Doors – 98L.x996L
3. Pairs of Doors with Mullion – 2 each 98L. x 996L x KR9954 mullion
4. Pairs of Doors without Mullion (cross corridor) – 2 each 9848L. x 996L (metal doors). Less bottom rod prohibited. (9848L) Require 2 point latching.
5. Proper handle designation is 06, 996L trim, with stainless steel finish
6. All lever exit device trim rim to incorporate Breakaway lever trim or Vandal resistant lever trim
7. Vertical rod devices not allowed on exterior doors
8. Electrified exit devices and electrified trim must be solely from approved manufacturers no conversions or retrofits
9. Use the above specified devices for fire rating according to NFPA.
10. US32D finish

H. Door Closers

Acceptable Manufacturer: LCN

Acceptable Substitutions: None

Types:

1. Cold weather fluid at all exterior doors and vestibule doors
2. LCN 4040XP closer, parallel arm, EDA (extra duty arm), metal cover
3. Arms: parallel arm 3077A, hold open arm 3049EDA
4. No drop plates. Coordinate window size and placement
5. In-swing doors –4040XP x 3077EDA, limited use of 4041T acceptable
6. Out--swing doors –4040XP x 3077EDA
7. Wall mounted magnets shall be used for hold open points. Electrified door closers with hold open points not acceptable
8. Auto Operators shall be LCN 4642 interior mounted electro-hydraulic device. Use long arm for frame reveals greater than 4 1/2"'
    a. 4-1/2" hardwired actuator LCN 8310-856
    b. Escutcheon for actuator: LCN 8310-874
    c. Wireless actuators not allowed

I. Door Pulls, Mop Plates, Kick Plates, Push Plates

Acceptable Manufacturers: Quality, Builders Brass/Trimco, Signature Brass, Rockwood

Features Required:

1. Plates shall be beveled on all four edges.
2. No offset pulls, straight only, 1" diameter
3. US32D or 630, no plated devices allowed, 0.05" thick

J. Overhead Stops/Holders

Acceptable Manufacturers: Glynn-Johnson-90 Series, Architectural Builders Hardware 9000 Series

Features Required:

1. Stops must be constructed of stainless steel
2. Through bolting required

K. Flush Bolts and Coordinators

Acceptable Manufacturers: Trimco or Ives

Flush Bolt types: Constant Latching, IVES FB51P

L. Door Stops

Acceptable Manufacturers: Glynn-Johnson, Builders Brass/Trimco, Ives, Rockwood

M. Keying

1. All locksets shall be keyed into existing MSBSD grand master keying system.
2. The Permanent Cores, Changing Keys, and Control Keys, prepared according to the approved keying schedule, shall be shipped directly to the MSBSD, prior to substantial completion. The Contractor shall remove the construction cylinders and install the permanent cylinders. All construction cylinders shall be returned to the MSBSD.
3. All Permanent Cylinders, Keys, and Key Transcript shall be sent via Registered Mail, Return Receipt Requested, to the MSBSD.
4. Furnish:
    a. Two control keys per keyway
    b. Six (6) Building Grand Master Keys
    c. Six (6) Master Keys per Set
    d. Four (4) change keys per Lockset and Cylinder
    e. Key Transcript with 25% extra change combinations

N. Key Cabinet

1. Gray colored 18 gauge metal cabinet with nickel-plated brass pin tumbler lock, with two keys
2. Two tag complete system with log book
3. Pre-numbered tags: one red octagon shaped, reusable; one white shamrock or oval shaped, reusable
4. Numbered label above hooks
5. Acceptable Manufacturers: Telkee Aristocrat model T2110 250 capacity; Lund Model #1204 250 capacity, #507 red tags, #504 white tags

O. Lock Cylinder Cores

1. Coordinate all work with MSBSD Locksmith to verify type, function and keying for all devices.
2. Provide Schlage FSIC interchangeable cores and Schlage recommended cylinder housings on all doors to match the MSBSD's keying system.
3. The MSBSD will furnish construction cores and keys on some projects. Verify with MSBSD Locksmith.
4. All keyed switches for electrical devices must have interchangeable (I/C) cores of the type to match the MSBSD's keying system.
5. Lock Cylinders shall have removable core housings. Manufacturer: Schlage

P. Thresholds

1. Exterior: Extruded aluminum full width single piece at exterior doors. 6 inch by ½" tall with beveled edges and anti-slip fluted top. J32130, PEMKO or equivalent.

Q. Weatherstripping (Typical and Exterior Doors)

1. Dense layered plastic bristle brush weatherstrip. Install all exterior doors and interior vestibule doors. Brush fibers fused into place, flexible and minus -30°F held in extruded aluminum holder-mount with pre-punched pre-slotted holes for mounting with screws. ANSI and PEMKO Corporation numbers listed, equivalent Sealeze or Zero.
2. Full length single piece. And under closer, stop and strike mount areas ¼" thick heavy duty rigid rubber gasket: PEMKO 2891AS.
3. Door head and Side Jambs: 40 to 45-degree angle mount, 3/8 inch brush ANSI R3A36 PEMKO 45041.
4. Door Bottom sweep 1-inch brush; ANSI R3A415 and PEMKO 18100.
5. Paired Doors Meeting Rails: 3/8"; ANSI R3A635 and PEMKO 18041

R. Door Silencers (Typical Interior Door)

1. Provide 3 evenly spaced rubber silencers at each swing doorjamb steel frame.

Division 09- Finishes

09 20 00 Plaster and Gypsum Board

Part 1- General

1.01 Gypsum Wallboard (GWB)

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

B. Do not use GWB in wet or damp areas such as restrooms and shower rooms.

C. Do not use GWB soffits at exterior unless covered by cement board, metal or other durable material.

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

E. In Junior/Middle and Senior High Schools, GWB shall be backed with 1/2-inch CDX plywood for impact resistance in corridors and entryways and in the gymnasium up to 12 feet high where cost prohibits masonry or concrete.

F. Elementary school gymnasiums where GWB is used as either a wall or ceiling surface shall have a backing of 1/2-inch CDX plywood up to 12 feet high.

G. Impact resistant GWB above 12 feet in gymnasiums is acceptable when budget prohibits masonry or concrete.

H. GWB ceilings are acceptable in certain areas if access panels are provided. Verify adequacy of access with MSBSD.

09 30 00 Tiling

Part 1- General

1.01 Summary

A. Provide 1/2-inch cementitious backer board, 1/4-inch Hardiboard, or 1/2-inch GP Dens-Shield on ceilings and vertical tiled areas.

B. Maximum stud spacing is 16 inches c.c. with 12 inches preferred.

C. Support and reinforce all joints.

D. Provide tiled walls and floors in all shower rooms.

E. Tiled walls in kitchen are preferred. Fiber Reinforced Plastic panels (FRP) wall finish is an acceptable lower cost alternative when budget is restrictive.

F. Quarry tile floors and coves in food service areas are preferred.

G. Use thick set mortar floors in all wet areas.

H. All ceramic floor tiles must have an anti-slip surface.

I. All specified tile shall be current run stock. Special order tile generally is not acceptable.

J. Extra (maintenance stock) tile to be delivered to MSBSD upon completion of project.
   1. 1% field tile of each color to a maximum of 10 square feet
   2. 15 pieces of each special tile of each color if special tile is used

K. Thin set mortar is acceptable for wall installations.

L. Provide quarry tile floors for large kitchen installations.

M. Specify a minimum five-year warranty on all ceramic tile installation.

N. 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.

O. All color schemes must be approved by MSBSD.

09 64 00 Wood Flooring

Part 1- General

1.01 Gymnasium Wood Flooring

A. Floor manufacturers shall be MSBSD approved. Seam pattern shall be submitted for approval. Installer must be manufacturer certified.

B. Materials shall not be delivered or installed until all masonry, painting, plastering and tile work is completed.

C. All overhead mechanical work, lighting, backstops and scoreboards are to be approved, installed, inspected and MSBSD accepted before installation of a wood gymnasium floor.

D. The room temperature is to be at least 65 degrees and relative humidity 50% or lower and otherwise in compliance with manufacturer's recommendations.

E. Contractor is to maintain area according to manufacturer's recommendations where materials are to be stored prior to installation.

F. Do not install floor system until concrete has been cured. Strictly adhere to manufacturer's moisture content limits and guidelines.

G. Do not begin installation of wood flooring until all other work in gymnasium has been completed except installation of bleachers and any other such work as must follow floor installations.

H. The entire wood gymnasium floor system shall be supplied by one manufacturer and installed by one approved subcontractor.

I. Finishing materials, sealer and game line paint shall be the manufacturer's standard products. Play lines may be inlaid in wood gymnasium flooring. Tape is not allowed.

J. Specifications are to require wood flooring be delivered to the construction site at least 30 days prior to installation in order to acclimate wood to environmental conditions. Flooring strips should be unbundled and "sticked out" to breathe in a temperature and

humidity controlled environment approximating installation conditions. Specify as per manufacturers' recommendations.

K. Specifications must require wood flooring subcontractor keep a log of humidity and temperature at start and end of each and every work day the flooring is being installed.

L. Specify vapor barrier between concrete slab and gym floor as per manufacturer's recommendation.

M. Specify vented floor systems with vented cove base. Unvented systems are not acceptable.

N. Game line layout and school logo is to be MSBSD approved.

O. Specifications should indicate at least two (2) coats of sealer be applied to floor to protect wood and painted game lines. Coatings are to be applied as per manufacturer's specifications.

P. All color schemes must be approved by MSBSD.

09 65 00 Resilient Flooring

Part 1- General

1.01 Luxury Vinyl Tile (LVT)

A. Use most durable material with lowest life cycle cost whenever possible.

B. Use of cutback adhesives is not acceptable.

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

D. All color schemes must be approved by MSBSD.

1.02 Resilient Flooring- Sheet Vinyl

A. Provide sheet vinyl with continuously welded seams in wet areas where tiled surfaces are not used.

B. Consider commercial grade, heavier duty material where budget will allow.

C. Use of cutback adhesives is not acceptable.

D. All color schemes must be approved by the MSBSD Superintendent or designated agent.

09 65 13 Resilient Base and Accessories

Part 1- General

1.01 Summary

A. Preformed corners, inside and outside, for all rubber base is the preferred specification.

B. Specifications for field formed corners are to be strict with detailed requirements for scribing and scoring.

09 65 66 Athletic Surfacing

Part 1- Products

1.01 Gymnasium Floors

A. Gymnasium floors in Elementary Schools shall be a synthetic material, preferably a poured floor or welded seam sheet goods.

B. Manufacturer for athletic surfacing: Should be reviewed with MSBSD .

1.02 Weight Rooms

A. Manufacturer: Material should allow for heavy equipment and free weights.

Width		Roll Width 4ft – Tile 2ft x 2ft
Length		Specify length (min. 15 ft)
Total Thickness		8 mm
Weight		1.92 lbs/sq.ft.
Tensile Strength	ASTM D412	200 minimum
Static Load	ASTM F970	1000 p.s.i (modified test)
Coefficient of Friction	ASTM 2047	>.9
Chemical Resistance	ASTM F925	Excellent
Ambient Noise Reduction	ASTM C423	.10
Impact Sound Insulation	ASTM E492	.45 minimum
Thermal Conductivity	ASTM C518	
Sound Transmission	ASTM 413	.45 minimum

09 68 00 Carpeting

Part 1- General

1.01 Modular Carpet

A. Modular carpet tile shall meet the following performance standards.

1.	Carpet Flammability	
	.1 Pill test (ASTM D2859 or CPSC FF-1-70)	Passes
	.2 Radiant Panel Test (ASTM E648)	$\geq$ 0.45 watts/cm^2, Class 1
2.	Smoke Density	$\leq$ 450 Flaming Mode
3.	Dimensional Stability (Aachen Method Din 54318)	$\leq$ 0.1% change
4.	Static Generation at 70°F (AATCC	$\leq$ 2.5 kV at 20% R.H.

	134 with neolite)	
5.	Lightfastness (AATCC 16E)	≥ 4.0 after 60 hours
6.	Gas Fade (AATCC 23)	4
7.	Ozone Fade (AATCC 109)	4
8.	Antimicrobial (ASTM 2471-05)	Complete to Partial Inhibition (high) on primary and fiber layers
9.	Antimicrobial (AATCC 174, Part II)	≥ 90.0% reduction
10.	Fungicidal (AATCC 174, Part III)	No growth
11.	Soil/Stain Protection (AATCC 175-1991)	≥ 8.0 on the Red 40 Stain Scale
12.	Sustainable Carpet Assessment Standard- NSF 140	EPD certified-preferred Minimal level Platinum

1.02 Definitions

A. The term “Carpet System” refers to the tufted yarn and yarn/pile treatments, primary backing, pre-coat, secondary backing, and adhesive.

1.03 Shop Drawings

A. Use the same project, Owner, building, floor, room, material, and product designations that appear on construction drawings and schedules. Indicate the installation company, General Contractor, drawing dates and scales. Show the following:

1. Columns, doorways, enclosing walls, partitions, built-in cabinets and equipment, and locations where cutouts are required in carpet.
2. Carpet manufacturer, type, style, color, and dye lot for each carpet specified.
3. Locations of expansion joints and treatments.
4. Type of substrate.
5. Type of installation.
6. Type of adhesive.
7. Type of wall base in each room/area.
8. Direction of carpet pattern/s.
9. Type, color, and location of edge and transition strips, and other accessories.
10. Transition details to other flooring materials.
11. Large-scale drawings showing treatment of steps and other areas where detailed work is required.
12. Mill Manufacturer Origin.

1.04 Product Data

A. Product Data and Samples

1. For each proposed carpet, submit two (2) samples of each standard color available. Once color or colors are selected, submit four (4) each 18" x 18" minimum samples of each selected color/s. A larger sample may be requested by the Project Manager.
2. For all Installation Accessories, submit manufacturer's specifications and data.
3. For adhesive(s), provide Material Safety Data Sheet.

B. Manufacturer's printed maintenance manuals for proposed carpet shall include the following:

1. Methods for maintaining carpet, including cleaning and stain removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet.
3. Material Safety Data Sheet for recommended cleaning and stain removal products.

1.05 Quality Assurance

A. Installer shall provide documentation showing experience performing similar installations; certification for commercial installations by the Floor Covering Installation Board or demonstrated compliance with its certification program requirements; and certification and warranty by the proposed carpet manufacturer to install carpet in this Project.

B. Provide products with critical radiant flux classification indicated as determined by testing identical products per ASTM E-648 by an independent testing and inspecting agency acceptable to MSBSD.

C. Product Quality

1. All carpet must be first quality with no seconds or imperfections and to be of one dye lot unless approved by Project Manager prior to shipping.
2. Carpet shall have a documented five (5) year history complying with Performance Characteristics listed in Products/Carpet/Performance Data certified by an independent testing laboratory. Carpet shall have a documented five (5) year history of excellent performance in K-12 public schools.
3. At MSBSD's option, on-site carpet may be tested for specification compliance at MSBSD's expense.

D. Carpet submitted shall be available in sufficient range of colors to enable MSBSD to select color(s) coordinated with Project's predetermined color scheme.

E. All color schemes must be approved by MSBSD.

1.06 Storage and Handling

A. Carpet and related materials shall be stored in a climate-controlled, dry space per specific manufacturer's instructions. Carpet shall be adequately protected from soil, dust, moisture, and other contaminants, and stored on a flat surface. Follow manufacturer's instructions for storing and stacking boxes of carpet tiles.

B. Carpet shall be transported in a manner that prevents damage and distortion.

1.07 Project Conditions

A. Do not install carpet until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained for a minimum of 72 hours prior to and after installation at levels normal to Project space when occupied for intended use.

B. Do not install carpet over concrete slabs until slabs have sustainable pH range and moisture level acceptable to specific carpet manufacturer.

1.08 Warranty

A. Special warranty specified in this Article shall not deprive MSBSD of other rights MSBSD may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Written warranty, signed by authorized agent of carpet manufacturer and by the manufacturer's warranted installer, agreeing to replace carpet that does not comply with requirements listed herein or that fails within specified warranty period. Warranty includes labor and materials for removal and disposal of failed product, substrate repair as required due to carpet removal, cost of replacement carpet, freight and delivery to site and cost of installation, including furniture, fixture and equipment moving expenses. Warranty does not include deterioration of failure of carpet system due to failure of substrate, vandalism, or abuse. Failures include, but are not limited to, more than 10 percent loss of face fiber, zippering, dimensional stability, edge raveling, snags, runs, delamination, backing resiliency loss, color fastness, stain resistance and static resistance properties of carpet system for the warranted period.

1. Warranty Period shall be 20 years wear from date of Substantial Completion.

1.09 Extra Materials

A. Before installation begins, furnish extra materials described below that match installed products. Package with protective covering for storage and identify with labels describing contents including manufacturer, carpet name/quality, carpet color name, and amount of carpet (sq. yds.).

1. Full boxes of carpet equal to 3 percent of amount installed for each type indicated, unless otherwise instructed by the Project Manager.

Part 2- Products

2.01 Carpet Physical Characteristics

A. Carpet Tile is preferred.

B. Tufted carpet construction.

C. Multi-level textured loop with maximum pile height variation of no more than 1/32".

D. Pattern to be non-directional and random in appearance. Minimum of five (5) distinctly different colors.

E. 100 percent bulk continuous filament cationic nylon fiber Type 6.6 with a modification ratio of no greater than 2.0, using Fiber Identification Cross Pattern and Analysis results according to AATCC TM 20.

F. 100% Solution dye

G. 2 to 4 yarn ply

H. 20-oz/sq. yd. minimum per ASTM D-5848 finished pile yarn weight. This weight does not include weight of backings.

I. Pile Thickness to be measured according to ASTM D-6859, adjust to meet density

J. Pile Density: Allowable minimum 6500. Density is calculated as follows: Density = (36 x Finished Pile Weight in oz. per sq. yd.) ÷ Pile thickness in inches as determined by ASTM D 5823.

K. Gauge: Minimum 1/10 per inch in accordance with ASTM D 418.

L. Minimum 10 stitches per inch.

M. Primary Backing must be non-woven. Woven primary backings not allowed.

N. Secondary Backing to be high performance, moisture impermeable 70 oz. minimum PVC or non-PVC backing system. Min 5 year proved record of successful performance in K-12 education use.

O. 9” minimum x 48” maximum size for plank tiles and 18” x 18” minimum to 36” x 36” maximum for square carpet tiled.

2.02 All test and performance data shall be performed and documented by an independent testing lab:

A. Carpet shall pass surface flammability of Methenamine Pill Tests ASTM D-2859 and CPSC ff1-70 (as found in 16 CFR 1630). 7 passes out of 8 specimens tested minimum.

B. Carpet to achieve a Class 1 rating: >0.45 watts/sq cm critical radiant flux and/or federal, state or local requirements per ASTM E 648 or a lower rating as allowed by all applicable codes

C. NBS Smoke Chamber Test: ASTM E-662 Test Method: carpet rating to be < 450 Dm in Flaming Mode or as allowed by all applicable codes.

D. By permanent means and without chemical treatment, static control shall be achieved below 3.5 kV when tested at 20% relative humidity and 70°F in accordance with Electrostatic Propensity Test, AATCC-134.

E. Carpet shall have an appearance rating based upon the 12,000 cycle Hexapod Drum Test performed in accordance with ASTM D 5252 carpet to achieve a minimum rating of 3.5 in severe use areas such as corridors, assembly areas, commons and minimum rating of 3.0 in heavy use areas.

F. Dimensional Stability: Tolerance of 0.2% maximum dimensional change in varying moisture condition per Aachen Test (I.S.O. 2551).

G. A minimum of 10lbs of force allowed to pull a single carpet strand from its primary backing in accordance with ASTM D 1335 Test method for Tuft Bind

H. A minimum rating of 4 after 160 AFU for 3 cycles using the AATCC Grey Scale for Color Change in accordance with AATCC 16, Option E.

I. Rating of not less than 4, wet and dry uses the ATCC Color Transference Scale in accordance with AATCC-165.

J. Minimum rating of 4 using the ATCC Grey Scale for Color change in accordance with AATCC-164 (oxides of nitrogen) and AATCC-129 (ozone) for 2 cycles.

K. Achieve a minimum rating of 4 on the AATCC Transference Scale in accordance with AATCC 107 Test Method. (for yard dyed carpet fibers only)

L. Achieve a minimum rating of 8 using AATCC Red 40 Stain Scale in accordance with AATCC Test Method 171 (HWE) for two (2) cleaning to simulate removal of topical treatments by hot water extraction followed by AATCC 175 Stain Resistance Test Method.

M. An average of 3 fluorine analyses per AATCC-189, using a single composite sample, to be a minimum of 500 ppm fluorine by weight when new and 400 ppm fluorine by weight after 2 AATCC-171 (HWE) cleanings. Single composite sample to be made by taking nine (9) fiber cuts across the entire width of the carpet.

N. A minimum of 3.5 lbs. per inch shall be allowed in accordance with ASTM D-3936.

O. Comply with NSF ANSI 140 and CRI IAQ Green Label Program Emission Requirement in accordance with ASTM D 5116.

P. All carpet shall comply with Section 4.5 of the ADA Guidelines.

Q. Non-toxic antimicrobial treatment of inherent properties for the life of the carpet as guaranteed by the manufacturer in accordance with AATCC 174 Part 1 (qualitative).

2.03 Installation Accessories

A. Trowelable Leveling and Patching Compounds: water-resistant, mildew-resistant, non-staining, latex-modified, hydraulic cement- based formulation provided by or recommended by the carpet manufacturer. Leveling and patching compounds shall be CRI Indoor Air Quality, or SCS certified.

B. Floor Sealers: Water-resistant, mildew-resistant, non-staining type as recommended by proposed carpet manufacturer, that complies with flammability requirements for installed carpet and that suits the sub-floor and leveling and patching compounds. Sealers shall be CRI Indoor Air Quality or SCS certified.

C. Adhesives: Water-resistant, mildew-resistant, non-staining type and releasable for life of the warranty to suit products and subfloor conditions indicated, that complies with

flammability requirements for installed carpet and that is recommended by the carpet manufacturer. Adhesive shall be CRI Indoor Air Quality or SCS certified.

D. Resilient Edge Strips

Part 3- Execution

3.01 Examination

A. Examine substrates, areas and conditions for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance. Verify that substrates and conditions are satisfactory for carpet installation and comply with requirements specified.

B. Verify that concrete sub flooring complies with the specific carpet manufacturer's recommendations and the following:

1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by the carpet manufacturer. Provide a copy of test reports to MSBSD.

2. Installer is responsible to assure surfaces are free of cracks, ridges, depressions, scale and foreign deposits.

3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 Preparation

A. Comply with carpet manufacturers written installation instructions for preparing substrates indicated to receive carpet installation.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depression in substrate.

C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by the carpet manufacturer.

D. Broom and vacuum clean substrates to be carpeted immediately before installing carpet. After cleaning, examine substrates for moisture, alkaline slats, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.03 Installation

A. Direct-Glue-Down installation shall comply with manufacturer's instructions.

B. Carpet shall be installed using manufacturer's recommended installation method and products in a manner that will allow its removal from substrate without damage or destruction of substrate or carpet and carpet backing for the life of the carpet.

C. Comply with Architect's direction for carpet pattern/pile of carpet; maintain specified carpet pattern, as required by Design Documents. At doorways, center carpet change of style, pattern or color under the door in closed position.

D. Do not bridge building seismic expansion joints with carpet.

E. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.

F. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use non-permanent, non-staining marking device.

H. Install pattern parallel to walls and borders, or as indicated by design.

I. Completed carpet installation is to be smooth and free of bubbles, puckers, bumps and other defects.

J. Carpet installations will be rolled with a 100 lb. carpet roller unless otherwise specified by manufacturer.

3.04 Cleaning

A. Perform the following operations immediately after installing carpet:

1. Remove excess adhesive, and other surface blemishes using cleaner recommended by carpet manufacturer
2. Remove yarns that protrude from carpet surface
3. Vacuum carpet using commercial machine with face-beater element
4. All rubbish, wrappings, trimmings and debris, etc. are to be removed from site and disposed of properly.

09 72 16 Vinyl-Coated Fabric Wall Coverings

Part 1- General

1.01 Requirements

A. Vinyl coated fabric wall coverings, rolled vinyl wall coverings, wall paper or other fabrics are not acceptable. These are not recommended for use in any area.

09 80 00 Acoustic Treatment

Part 1- General

1.01 Summary

A. When 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 Acoustic Tile (SAT) ceiling systems wherever practical.

C. Provide wall and ceiling mounted acoustical panels within gymnasium space. Wall and/or ceiling surfaces in gymnasiums and multi-purpose rooms should be designed to help reduce reverberation and absorb sound.

D. Unbacked, perforated hardboard is not an acceptable acoustic baffle in gymnasiums.

1.02 Suspended Acoustical Tile (SAT) Ceilings

A. Installation to conform to International Building Code (IBC) 2006 or most recently adopted code.

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

C. SAT ceilings are preferred for all spaces, except those subject to damage, such as gymnasiums. GWB ceilings are acceptable for special areas, verify with MSBSD. Use washable type tiles in kitchens.

D. Ceiling heights should be kept sufficiently high in corridors to prevent students from jumping up and hitting the ceiling. A desired ceiling height in junior and senior high schools is at least 10 feet. When ceiling heights must be lower impact resistant ceiling materials must be used.

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

F. SAT ceilings of any type are not acceptable in gymnasiums, multi-purpose rooms and dressing rooms.

09 91 00 Painting

Part 1- General

1.01 Painting Requirements

A. Corridors, kitchen, locker rooms and restrooms require special attention. Durable finishes such as semi-gloss Alkyd enamel or epoxy have performed well. Avoid high gloss wall finishes due to defect magnification. Use of slight texturing or other effects is preferred; for example, consider stipple texture in paint system.

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

C. Semi-gloss enamels are preferred in classrooms.

D. Require all exterior wood be back-primed before installation on building.

E. Select light colors for the base field color in all areas. Do not use dark colors that absorb light.

F. Prefer maintenance-free corridor finish. If necessary, painted corridor surfaces are to be a washable semi-gloss paint.

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

H. All paint colors and types must be MSBSD approved before field application. Sherwin Williams Promar 400 semi-gloss finish or MSBSD approved equal.

I. There should be one coat of primer and two finished coats of paint on all GWB.

J. Door frames shall have 2 coats of finish.

K. Drywall finish:

1. Level 4- Interior walls, corridors, kitchens
2. Level 3- Fan Rooms, mechanical rooms

Division 10- Specialties

10 00 00 Specialties

Part 1- General

1.01 Summary

A. Provide metal nosing's on risers in all Music Rooms. Carpet must extend underneath nosing.

B. Boot racks are to be a minimum height of 4 inches from finished floor. Provide a plastic or seamless aluminum/galvanized pan under boot rack to catch water. Consider elevating boot rack above resilient flooring to allow mopping and sweeping underneath.

C. Provide marker trays on all marker boards except in gym or MPR due to possibility of injury.

10 11 00 Visual Display Surfaces

Part 1- General

1.01 General Guidelines

A. Provide adequate fire-retardant blocking for all marker and tack boards and interactive boards.

B. Provide two flag holders per classroom.

C. Map rails with map hooks are required on all white boards.

D. Indicate blocking behind all marker, tack and interactive boards when installed on either wood frame or metal frame partitions.

E. Board height is maximum 7 feet from top of board to finish floor. Exceptions are considered with MSBSD approval.

F. Provide standard size marker boards with map rails and map hooks. Discuss all board selections (type, color, size and configuration) with design committee during design development.

G. Provide porcelain on steel white marker boards with Manufacturer's 50 year warranty.

H. The use of field applied tackable wall surfacing with aluminum edge and joint trim as an alternative to tack boards is acceptable with MSBSD approval.

10 14 00 Signage

Part 1- General

1.01 Sign Criteria

A. All interior signage to comply with Americans with Disabilities Act (ADA) requirements.

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

C. Interior signage is to be mechanically fastened in all schools.

D. All rooms are to be numbered, including all support spaces. Support spaces such as mechanical, IT rooms and storage rooms shall have room use as part of signage. (Ex. Fan Room, MDF and Fire Sprinkler room)

E. Numbering system shall be as follows: basement (if applicable) numbered one (1) thru ninety-nine (99), first floor numbered one (1) thru one hundred ninety-nine (199) unless a basement exists, first floor will begin with one hundred (100), second floor numbered two hundred (200) thru two hundred ninety-nine (299) and so on. Rooms shall be numbered in a sequential clockwise logical order.

F. Exterior signage generally shall not be fabricated using wood for the sign material. All school identification signs are subject to approval by the MSBSD for style and content. Security camera signage quantity and location shall be adequate to notify public and is subject to approval by the MSBSD.

G. Specifications are to require Contract to install MSBSD supplied Knox Box Model 3207 dark bronze.

H. Specifications are to require Contractor to provide and install 18” x 24” bronze facility dedication plaque. Specific message text will be approved by MSBSD during project prior to Contractor ordering and installing.

I. Specifications are to require Contractor coordinate AK DOT approved directional signage. Specific message text will be approved by MSBSD during project prior to Contractor ordering and installing.

10 21 13 Toilet Compartments

Part 1- General

1.01 Summary

A. Provide vandal resistant toilet partitions. Vandal resistant means graffiti, scratch, marking, flame and impact resistant.

B. Specify toilet partitions which are smooth solid high density polyethylene (HDPE) rigid plastic panels with cast through integral plastic color not less than one inch thick with hardness that meets 68 Shore “D” per ASTM D2240.

C. Provide toilet partitions which are braced at the floor and ceiling and continuous wall brackets.

D. Partitions between urinals shall be anchored to floor.

E. Top rails should be designed to discourage students from either swinging or hanging on them.

F. All hardware on toilet partitions is to be stainless steel.

G. Provide ADA accessible hardware.

H. Mount coat hooks in accessible stalls at 48 inches above finished floor.

10 22 26 Operable Partitions

Part 1- General

1.01 Folding Partitions

A. Due to high cost verify requirements for individual projects with the MSBSD

B. Operable partitions can be single, paired or continuously hinged series of individual flat panels

C. Top track support with manual operation

D. Interlocking seals as required

E. Must meet acoustic requirements

F. Must meet Fire Codes requirements where applicable

G. Installer must be manufacturer certified

1.02 Accordion Partitions

A. Accordion-type folding partitions are not acceptable.

10 26 13 Corner Guards

Part 1- General

1.01 Summary

A. Provide corner guards on all GWB partitions in corridors and other high use areas.

B. Corner guards shall have minimum 2” legs and be mechanically fastened to wall.

C. Corner guards are not necessary on CMU. CMU should use bull-nose corners where exposed to traffic.

10 28 00 Toilet, Bath, and Laundry Accessories

Part 1- General

1.01 General Requirements

A. The Architect shall verify if the following toilet room accessories shall be MSBSD selected and/or MSBSD supplied to match MSBSD standard to assure proper fit of paper products and replacement of damaged units:
   1. Soap dispensers
   2. Toilet paper holders
   3. Waste receptacles
   4. No built in waste receptacles
   5. Feminine napkin disposals
B. Architect shall select other toilet room accessories which include, but is not limited to:
   1. Metal framed mirrors
   2. Shower curtains and curtain rods
   3. ADA Accessible seating in showers and tubs as required by code
   4. Air Blade hand dryer
C. The Architect is to provide drawings, which clearly lay out the position of all toilet room fixtures, specialty items and devices. Drawings and specifications shall indicate blocking requirements for MSBSD and Contractor furnished specialties. Ensure items are placed in locations to comply with the Americans with Disabilities Act (ADA).
D. Each toilet accessory item shall be identified in the specifications and on the plans as to make and model to facilitate the coordination of blocking requirements.

10 44 16 Fire Extinguishers

Part 1- General

1.01 General Requirements

A. Provide Code appropriate fire extinguishers for facility.
B. Provide Class K type fire extinguishers in Food Service areas.
C. Prefer brushed aluminum or stainless steel finish cabinets for fire extinguishers provided in public areas.
D. Label “Fire Extinguisher” in red color, minimum 1-inch high letters as required by OSHA.
E. Quantity and locations to be determined during design development.

10 51 00 Lockers

Part 1- General

1.01 Typical “Student” Locker

A. Verify locker types with MSBSD.

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

C. Provide fully enclosed bases with lockers and 3-point latching of locker doors.

D. Welded lockers preferred. If knock down lockers are provided, lockers are to be riveted not bolted.

E. Handles and locks shall not protrude. Recessed built-in locks must be Master Lock.

F. Doors are to have continuous 16 gage piano hinge.

G. Doors will be minimum 14 gauge steel with full height 3-inch minimum width edge and door stiffener.

H. Minimum 4” curb height.

I. Provide number plates with lockers.

J. Each locker to have one shelf, one double-prong ceiling hook and three single-prong wall hooks.

K. Provide ADA accessible lockers as determined by IBC.

L. Locker height must be approved by MSBSD.

1.02 Athletic Lockers

A. Verify locker types with MSBSD.

B. Lockers are to be well ventilated with vent perforated doors and sides having penetrations no larger than 1/4 inch.

C. Door faces are to be 14 gauge with edge and door stiffeners.

D. Provide hasps in recessed area for padlock.

E. Provide number plates with lockers.

1.03 Elementary School Cubbies

A. Provide open cubbies, coat hooks and boot racks with grates in each Elementary School classroom.

10 75 00 Flagpoles

Part 1- General

1.01 General Requirements

A. Flag poles are to be 30 feet in height.

B. Revolving external heavy cast double truck.

C. Specify cone tapered seamless aluminum flag pole with double 5/16” braided polypropylene halyards.

D. Gold aluminum truck.

E. All exposed aluminum surfaces shall have clear anodized finish.

F. Cleats for halyards shall have lockable covers. Padlock type lock preferred.

G. Locate near main entrance, accessible by sidewalk, preferably on a raised portion.

H. Locate flagpole off all main sidewalk surface.

I. Lighting must be considered on all Flagpoles.

Division 11- Equipment

11 00 00 Equipment

Part 1- General

1.01 General Comments

A. Carefully review each piece of equipment which is to be placed in the building. Verify size, storage, access and specialty requirements such as power, water hookup, exhaust, code compliance, etc.

B. Provide schedule of all Contractor installed equipment to MSBSD as part of the design development submittal.

C. Provide schedule of Owner Furnished Contractor Installed (OFCI). Provide time frame for schedule.

11 12 33 Parking Gates

Part 1- General

1.01 Gates Functional Design

A. Defines and provides the designated entries/exits.

1.02 Design Criteria

A. No installation of motor operators at vehicle gates except requested by MSBSD.

B. Custodial lighting circuits will be coordinated with main vehicle gate locations.

11 13 00 Loading Dock Equipment

Part 1- General

A. If the building requires a loading dock, provide a covered loading dock and entry (dock height 44”) hand operated dock leveler. Verify dock and bumpers extend outward farther than the canopy to protect canopy from impact of tall trucks.

B. As per OSHA requirements, include a railing or safety chain around loading dock if dock is higher than three feet.

C. Provide permanent OSHA approved platforms on at least one long side of the dumpster to minimize lifting requirements for custodial staff that is a minimum of 3 feet in length.

11 14 13 Pedestrian Gates

Part 1- General

1.01 Gates Functional Design

A. Defines and provides the designated entries/exits.

1.02 Design Criteria

A. No installation of motor operators at vehicle gates except requested by MSBSD.

B. Custodial lighting circuits will be coordinated with main vehicle gate locations.

11 20 00 Commercial Equipment

Part 1- General

1.01 Industrial Equipment

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

B. Provide acoustical separation from other areas of facility.

C. Provide a separate room for shop dust collection equipment and coordinate dust collection system and shop equipment.

D. Shop equipment is to be MSBSD specified with Contractor furnish and installation. Coordinate individual equipment with MSBSD as part of design development.

E. All work benches shall be equipped with compressed air with quick disconnect fittings, hoses and piping.

11 40 00 Food Service Equipment

Part 1- General

1.01 General Requirements

A. Adequate kitchen space in initial design proposal to reflect numbers to be served and style of service. This space will include: storage area, mop sink or custodial closet, restroom and or office area. The serving, prep, loading and or staging area all need to be in this original space design.

B. Carefully coordinate Food Service Equipment requirements with other Divisions.

C. Review kitchen requirements with MSBSD. Carefully coordinate size of kitchen sinks, spray nozzles, dishwasher installation and size and type of trays to be used. All traps must be self-priming above floor.

D. Comply with applicable National Sanitation Foundation (NSF) standards and recommended criteria.

E. Ensure Alaska Department of Environmental Conservation (ADEC) sanitarian review and approval/permit for entire kitchen installation prior to final drawings.

F. Be sure proper water temperature of 140° is available. Booster water heaters for dishwashers are necessary and required.

G. Design adequate exhaust for kitchen equipment. Provide exhaust hoods for all heat producing equipment and exhaust fan for kitchen in general.

H. Provide floor sinks for drainage of hot food wells, etc.

I. Kitchen equipment and sinks must have grease traps with easy access and clean out.

J. Ensure adequate access with power and light necessary to provide for maintenance capability for all freezer and refrigerator condenser units.

K. Locate all condensers within building for ease of maintenance.

L. Locate all condensers in areas that the compressor motor and pump noise does not disturb students.

M. Ensure adequate data access with proper data outlets for food service computers, and designated setup areas.

N. Monitor refrigeration unit temperatures. (Ex. MasterBilt Dial Access Milk Cooler, Shelleymatic NDF cooler, Continental Refrigerator, Beverage-Air)

N. All eyewash stations shall be installed in compliance with Federal, State and local codes, including location, temperature control, etc. Because of the type of chemical used, MSBSD requires eye wash stations in all custodial closets that have chemical mixing stations, science prep, kitchens, vocational labs and the Nurse's office.

11 53 00 Laboratory Equipment

Part 1- General

1.01 General Requirements

A. Ensure provision for master shutoff for gas and downstream insolation valves for individual lab classrooms.

B. Ensure provision of automatic emergency shower/eyewash station with floor drain in every room that chemicals are mixed or used.

C. Provide acid proof drains, tops, sinks and flooring.

D. Each lab sink must have readily accessible plaster/clay trap for easy clean out.

E. Fume hood shall have explosion proof motors, lights and switches and shall be vented directly to the exterior of building.

F. Include flow and riser diagrams, including gas, air and all associated support systems.

11 66 23 Gymnasium Equipment

Part 1- General

1.01 General Requirements

A. All athletic and recreational areas and equipment must meet ADA guidelines.

B. Considerations should be made of design for a mezzanine track built into the gym.

1.02 Acoustic Considerations

A. Gymnasium walls shall be designed to reduce reverberation and absorb sound to accommodate use as multipurpose room.

B. All noises, either of inside or outside origin, should be reduced to levels that will not interfere with the hearing of speech or music. This includes both direct (unamplified) and reinforced speech or music.

C. Gymnasiums and associated restrooms must be configured in a way that they can be easily isolated from the remainder of the facility for after school activities.

D. Provide adequate storage and handling facilities for the mats used as part of the physical education curriculum.

E. Provide mat hoist(s) for wrestling programs.

F. Make storage space provisions throughout the facility but make special provisions in the following areas: Kitchen, Gymnasium, Multipurpose Room, Auditoriums, Stages and Dressing Rooms, Library and Music Rooms.

G. Provide for a commercial washer and dryer in gymnasium areas.

Part 2- Products and Execution

2.01 Gymnasium Curtain Dividers

A. Divider curtains are to be Fire Marshal approved type with lifetime flame-retardant and flame-resistant qualities.

B. Material shall be vinyl fabric equal to Herculite #80. Net shall be 7/8" square #252 knotless nylon netting. Vinyl fabric shall be at least the first 10 feet high with the balance to be net top. All seams minimum double lock stitched with #69 nylon thread using full-length, unspliced widths of fabric.

C. Curtains are to be motorized, indirect mount, fold up curtains. Factory inserted personnel doors ("man-doors") are to be included as part of the curtain supplied. Accordion or other types of moveable walls are not acceptable.

D. Curtain to extend full height of gymnasium, except when sloping ceilings occur.

E. Curtain to be a combination of vinyl and nylon mesh with vinyl portion of curtain extending up at least 10 feet above finished floor. Hoist mechanism to be remote key operated only with motorized indirect mount; fold up curtain Protective limits to be used on system, including emergency stop switches and thermal protection.

2.02 Wall Protection Mats

A. Wall mats must not contain any exposed foam plastics.

B. All cutouts in mats (light switches, outlets, etc.) must be thoroughly covered and repaired with the same mat surfacing material.

C. Material must be puncture resistant and self-healing to small punctures, such as pencil holes.

D. Place mats near athletic equipment and specifically under pull-up bars. (Ex. End of court under baskets)

2.03 Volleyball Standards

A. Volleyball standards are to be a stand-alone cantilevered system which does not require guy-wiring or guy-anchors.

B. Floor plates and sleeves shall be chrome plated.

C. Standard system shall be adaptable to badminton and tennis.

D. Volleyball nets and standards are not to interfere with basketball backboards and hoops.

E. Elementary- Provide (2) volleyball standard inserts and (3) badminton standard inserts.

2.04 Mat Hoist

A. Provide mat hoist(s) at secondary schools.

B. Provide vertical lift type only, unless horizontal applications are necessary.

C. Coordinate individual project mat hoist requirements with MSBSD during design development.

2.05 Wall-Hung Athletic Equipment

A. Avoid athletic equipment with protruding fasteners or other dangerous protrusions.

B. Provide wall mats under athletic equipment such as pull-up or chin-up bars.

C. Climbing wall should be 4” off floor.

2.06 Mirrors

A. All mirrors in athletic areas must be laminated safety glass.

B. Full length mirrors must not be mounted less than 24 inches from floor.

11 68 13 Playground Equipment

Part 1- General

1.01 General Requirements

A. Playground areas for elementary schools shall conform to following standards:

1. National Playground Safety Institute Standards

2. American Society for Testing and Materials (ASTM), F1292, F1487, F1951 (1995) (2001e1) Playground Equipment for Public Use
3. Consumer Public Safety Council (CPSC), Pub No. 325 (2008) Handbook for Public Playground Safety (www.cpsc.gov)
4. Approval by the MSBSD
5. Current ADA requirement as applicable to playground equipment.

B. Require all playground equipment and safety surfacing has current International Playground Equipment Manufacturers Association (IPEMA) and CPSC Certification for Safety. (www.ipema.org). The IPEMA Certification process ensures compliance with the current ASTM F-1487 Public Playground Safety Standard.

C. Require job specific affidavit from the manufacturer that the equipment design and play area meets ADA requirements.

D. A 6-foot high chain link fence with 2" ground clearance, knuckles up and down, shall be installed around perimeter of playground to help staff monitor children during the school day and to control motor vehicle traffic after hours. Fence shall have gates to permit appropriate access for snow removal, maintenance equipment and fire equipment as required.

E. All slides shall be free standing and mounted in an approved safety fall zone area including Kindergarten area where straight slides may be component mounted on multiple play units.

F. No play equipment shall have a platform height over six-foot high for lower grades and eight-foot high for upper elementary grades.

G. Playground is to be designed to allow for separate running areas for open play. Provide open line-of-sight for activities monitoring of all play areas. All areas must have appropriate drainage.

H. Playground surfacing methods are to be approved by MSBSD and will be dependent upon soil conditions and drainage.

I. Consideration must be given for a designated snow storage area that will not interfere with play areas.

J. All playground equipment shall be provided with an ASTM approved fall zone surfacing contained by appropriate border construction and otherwise complying with safety standards cited above.

K. Be aware of special performance requirements for playground equipment such as no trapeze rings because of mittens and no small toeholds or flat surfaces because of large boots.

11 68 33 Athletic Field Equipment

Part 1- General

1.01 ADA Requirement

A. All parts of athletic field must follow ADA minimum standards or higher.

11 68 33.33 Baseball Field Equipment

Part 1- Products

1.01 Pitcher's Rubber

A. Four-sided molded rubber on a cylindrical aluminum core.

1. 24-inch long by 6-inch wide to meet requirements of MLB (Major League Baseball).

1.02 Baseball Bases

A. Set of three bases (per field)

1. 15-inch by 15-inch by 3-inch to meet requirements of MLB.
2. White, weather resistant rubber with ultraviolet inhibitors
3. Include anchor mounts, ground anchors, and plugs.

1.03 Softball Bases

A. Set of three bases (per field)

1. First base: double base, 30-inch by 15-inch by 2.5-inch half in orange, half in white, manufactured to be of equal height.
2. Second and third bases: 15-inch by 15-inch by 3-inch, white, to meet requirements of MLB.
3. Weather resistant rubber with ultraviolet inhibitors
4. Include anchor mounts, ground anchors, and plugs.

1.04 Home Plate

A. Five-sided plate based on a 17-inch square to meet requirements of MLB.

1. White, weather resistant rubber with ultraviolet inhibitors.
2. 1.5-inch thick
3. Include anchor mounts, ground anchors, and plugs.

1.05 Foul Pole

A. Pole:

1. 6-inch schedule 40 (6-5/8 inch OD) aluminum foul pole with wing.

2. 30 foot above grade height
3. Power-coated yellow

B. Angled wing fabricated of 0.125 inch Aluminum:
1. Stamped mesh with 1.50 inch by 1.50 inch punchouts
2. 1.5 feet wide by 22.0 feet long starting 8 feet above finish grade.
3. Double reinforced bends, welded at corners
4. Powder coated yellow

C. Accessories
1. Stainless steel assembly bolts and nuts
2. Base plate of ground sleeve system

Division 12- Furnishings

12 21 00 Window Treatments

Part 1- General

1.01 Window Treatment Requirements

A. Provide energy efficient Honeycomb blinds in all exterior offices and classrooms. Interior blinds for privacy reasons reviewed by MSBSD.

B. Head rail housing prefinished, formed metal box internally fitted with blind mechanics, with cords and control rods provided as part of assembly.

C. Provide for sufficient backing into surrounding construction for durability.

D. One color used throughout facility.

12 22 00 Drapes and Curtains

Part 1- Stage Curtains

1.01 Stage Curtains Descriptions

A. Provide cloth drapes in staged music rooms as required for acoustics.

B. Complete stage-curtain systems, including stage curtains, tracks, draw-curtain machines and rigging with necessary accessories for support and operation.

C. Obtain stage-curtain systems from single manufacturer.

D. Stage-curtain systems and attachments to structure shall withstand the effects of gravity and operational loads and the weight of curtains.

1.02 Fabrics

A. Curtain fabrics should be permanently fire resistant or chemically flame resistant and of heavyweight woven cotton velour.

B. 100 percent polyester fabric lining, black.

C. 54 inch minimum width.

D. All curtains must meet current NFPA codes with lifetime flame-retardant and flame resistant qualities.

1.03 Curtain Bottom Weights

A. Manufacturer’s standard segmented weights to suit each curtain type and location shall be provided.

B. Manufacturer’s standard, continuous weight tape to suit each curtain type and location shall be provided.

C. Manufacturer's standard or recommended stiffening pipe or conduit that slides into bottom hem and is suitable for curtain type and location indicated shall be provided.

1.04 Curtain Accessories

A. S-Hooks should be Manufacturer's standard heavy-duty plated-wire hooks, not less than 2 inches long.

B. Tie lines should be No.4 or No. 4-1/2 cord or braided soft cotton tape, black or white to best match curtains, not less than 5/8 inch wide by 36 inches long, threaded through grommets.

C. Snap hooks should be manufacturer's standard heavy-duty hooks, blind sewn to top hem of curtain.

1.05 Aluminum Curtain Track

A. Aluminum track should consist of extruded aluminum, ASTM B 221; alloy and temper as recommended by manufacturer for strength and corrosion resistance; mill finish; complete with necessary accessories for support and operation.

B. Curtain rails shall be single or double curtain capacity as indicated. Provide end stops for track rails.

C. Curtain carriers should be standard carriers with a pair of nylon-tired ball-bearing wheels riveted parallel to plated-steel body. Equip carriers with rubber or neoprene bumpers and nylon glide strips to reduce noise, and heavy-duty, plated-steel swivel eye for attaching curtain snap or S-hook. Provide quantity of curtain carriers sufficient for track length, to suit curtain fabrication.

1. One master curtain carrier, for each leading curtain edge, with two pairs of nylon-tired ball-bearing wheels riveted parallel to plated-steel body should be provided.

D. Steel pipe for supporting both sections of suspended curved tracks.

E. Steel clamps and brackets of sufficient strength required to support loads for attaching track to overhead support.

F. Where indicated, equip carriers with rear-fold or backpack guide and rubber spacers to fold curtain from the offstage end of the track; sized for use with operating line if any.

G. For manual walk-along operation, fabricate curtain track without cord, cable, pulleys, or floor pulley.

H. For motorized function fabricate curtain track with cord and pulleys.

1. Operating line should be 1/4 inch diameter, stretch-resistant operating cable consisting of braided synthetic-fiber jacket over galvanized wire cable.

2. End pulley should have one single dead-end and one double live-end pulley. Provide sheave(s) with shielded ball bearing(s), housed in plated-steel body finished to match track. Provide with bracket for securing off-stage curtain end.

1.06 Draw-Curtain Machines

A. Operating machine of size and capacity recommended and provided by track manufacturer for each motorized curtain specified; complete with electric motor and factory-prewired motor controls, starter, gear-reduction unit, brake and control station.

B. Operator type should be cable drum with grooved drum and cable tension device to automatically take up cable slack and retain cable in grooves.

C. Should be traction driven.

D. Motor should be size sufficient to start, accelerate, and operate curtain in either direction from any position at indicated speeds without exceeding nameplate rating or service factor.

   1. Single phase
   2. 115 V, 60 Hz
   3. Continuous duty at ambient temperature of 105°F and at altitude of 3300 feet above sea level

E. Controllers, disconnect switches, wiring devices, and wiring shall be manufacturer's standard unless otherwise indicated.

F. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.

G. The Control Station should consist of a three-button control station with push-button controls labeled "Open", "Close", and "Stop".

H. Should have fully closed and fully open preset stops.

12 30 00 Casework

Part 1- General

1.01 Cabinets and Storage

A. Provide common key for common group cabinets in individual labs. Review keying of cabinets with MSBSD locksmith and MSBSD 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 have flush mounted handles with swing of 180°.

D. Review cabinet specification in detail with MSBSD. MSBSD is looking for first quality, perdurable cabinets with substantial plywood bases and heavy duty edge banding and sturdy hardware.

E. Cabinet Locks

   1. Door Locks: Schlage CL100PB 626 or Olympus 700SC 26D
   2. Drawer Locks: Schlage CL200PB 626 or Olympus 800SC 26D
   3. Strikes

a. Plastic bar strikes ½" Schlage CL10-355 or Olympus 10-055

b. Plastic bar strikes ¼" Schlage CL10-354 or Olympus 10-054

c. Olympus 12-2 26 D Metal angle bracket, .074 thickness

4. Do not kerf cabinet surfaces for projection of cabinet lock bolt. Use angle strikes or bar strikes to achieve latch.

5. Key Blanks

   a. To be Schlage original key blanks stamped "Do Not Duplicate" and change key designation per stamping instructions included with pinning instructions.

6. Locks to be 6 pinned cylinders with Schlage OEM pins

7. Supply 6 master keys

8. Supply 4 cabinet keys per change key set

9. MSBSD will provide pinning list per request

10. Pinning Requests

    a. Supply room numbers and lock quantities with request for pinning list

    b. Use the chosen Schlage Classic keyway on pinning list report

12 60 00 Multiple Seating

Part 1- General

1.01 Bleachers

A. Interior bleachers selection requires specific approval from MSBSD.

B. Preferred bleacher type is wall attached, molded plastic seat assembly with motor operation (traction) with automatic stop for systems more than five rows deep.

12 93 00 Site Furnishings

Part 1- General

1.01 Exterior Areas

A. Exterior benches, planters, handrails, fences, barricades, walkways, etc. shall be constructed of durable and sustainable materials.

B. Baseball Bleachers shall be aluminum low-rise bleachers with no more than four (4) rows.

Division 13- Special Construction

13 20 00 Special Purpose Rooms

Part 1- General

1.01 Seclusion Room

A. Fire Marshal approval must be obtained. This is done on an "Application for Code Modification". The following wording is suggested:

"The Seclusion Room is intended to restrict students to a room for a minimal time limit as a behavioral deterrent; when the button is engaged the student is restricted, but only constant pressure engages door; release of button frees access."

B. Door, frame and hardware specifications, see 08 34 00.

C. Address Sprinkler Head – no protrusions; must be flush.

D. Address Light Switches – outside of room.

E. Address Lights – no protrusions; must be flush.

1.02 Nurse's Office

A. Locate near or adjacent to administration area to allow shared responsibilities.

B. Provide strong safe secure location in the Nurse's Office for drug storage.

C. Provide extra storage as necessary for spare clothing, wheel chair, CPR aids, screening aids, crutches, etc.

D. Provide refrigerator with built-in ice-maker.

E. Nurse's office electric and lighting shall be included on emergency circuits for generated power.

13 34 16 Grandstands and Bleachers

Part 1- General

1.01 General Requirements

A. Design grandstand system, including comprehensive engineering analysis by a qualified professional engineer registered in Alaska, using performance requirements and design criteria indicated.

B. Grandstand systems shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

C. Allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, openings of joints, overstressing of components, failure of joint sealants, failure of connections, and other

detrimental effects. Base engineering circulations on surface temperatures of materials due to both heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 90°F, ambient; 150°F, material surfaces.

D. Elevated Angle Frame Grandstands

1. Quantity and Size should be as indicated on Drawings.
2. Prefabricated galvanized steel or aluminum angle spaced at 6'-0'' intervals joined by means of galvanized steel or aluminum angle cross bracing
3. Shop connections shall be welded to meet AWS standards and local code requirements.
4. Internal splices, where required shall be two per joint, and shall penetrate the joint a minimum of 8 inches in each direction and be riveted at one end only to allow for contraction and expansion.
5. Closed riser construction with 8-inch vertical rise and 24-inch tread depth. Seat height is 17 inches above its respective tread.
6. Seats shall be nominal 2-inch by 10-inch anodized aluminum with anodized end caps.
7. Treads shall be nominal two (2) 2-inches by 10-inch mill finish aluminum with mill finish end caps on all rows. Planks must be placed in such a way that there are no openings in the deck greater than 4 inches and no gaps between planks greater than 1/4-inch.
8. Closed riser construction with nominal two (2) 1-inch by 6-inch anodized finish aluminum with anodized finish end caps on top row. Nominal one (1) 1-inch by 6-inch anodized finish aluminum with anodized end caps on all other rows.
9. Aisle footboards shall be of aluminum alloy and be of mill finish with contrasting aisle markings. Three aisle stiffener angles shall be used to strengthen the aisle step. Aisles shall be 54 inches wide.
10. Aisle handrail shall be anodized aluminum pipe with intermediate rail.
11. Stair frames shall be of galvanized steel of mill finish aluminum angle with 2-inch by 12-inch mill finish aluminum plank with step riser and contrasting aluminum nose. Guardrail and handrails shall be provided for stairs as required. Stairs shall have two line rails 36 inches above nose of step. Handrails shall extend in the direction of the exit steps 12 inches beyond the end of the steps. Ends shall terminate in newel post. Stairs shall be compatible with walkway and for seating.
12. Walkways, ramps and decks shall be decked with mill finish aluminum on galvanized steel or aluminum frames. Ramps shall have a 12 to 1 slope and shall not run more than 30 feet without a 5-foot landing. Length of ramp will be determined by walkway elevation as shown on plans. Walkway minimum width shall be as per local

amendments to the ICC 300-2007 and IBC. Dimensions as required and as shown on plans.

13. Guardrail shall be two lines of anodized aluminum tube with galvanized chain link fence 42 inches above the seats on both ends of the grandstand and across the back of the grandstand. Install end plugs and elbows where required. Front guardrails shall be three lines of aluminum tube with galvanized chain link fence. Top rails at sides, rear and front shall be 42 inches above the leading edge of seat or walking surfaces. Rail supports shall be manufacturer standard galvanized steel or aluminum angle and/or tube.
14. Handicapped accessibility shall be provided as required by code.

Part 2- Products

2.01 Materials and Finishes

A. The supporting framework shall be fabricated from aluminum or galvanized steel.

1. Structural Fabrication with aluminum alloy 6061-T6 mill finish. Each frame shall be unit-welded, using metal inert gas method, under guidelines by the American Welding Society. All cross bracing and horizontal bracing shall be aluminum angle 6061-T6 mill finish.
2. Structural fabrication with galvanized steel. Each frame shall be unit-welded, using metal inert gas method, under guidelines by the American Welding Society. All cross bracing and horizontal bracing shall be galvanized steel. After fabrication all steel shall be hot dipped galvanized to ASTM A-123 specifications.

B. Extruded Aluminum

1. Seat planks shall be aluminum alloy 6063-T6, clear anodized 204R1, AA-MC10C22A31, Class II. With a minimum wall thickness nominally 0.078-inch for impact and deformation resistance.
2. Tread and riser planks shall be aluminum alloy 6063-T6, mill finish. With a minimum wall thickness nominally 0.078-inch for impact and deformation resistance.
3. Entry stair and ramp frames shall be aluminum ally 6063-T6 mill finish.
4. Guardrail Pipe shall be 1-5/8-inch OD schedule 40 aluminum alloy 6105-T5, clear anodized 204R1, AA-M10C22A31, Class II.

C. Accessories

1. Channel end caps shall be Aluminum alloy 6063-T6, clear anodized 205R1, AA-M10C22A31, Class II.
2. Bolts and nuts shall be hot dipped galvanized or stainless steel as appropriate.
3. Hold Down Clip Assembly shall be made of Aluminum alloy 6063-T6 mill finish.

Part 3- Execution

3.01 Erection of Structural Framing

A. Erect angle frame grandstand system according to manufacturer's written erection instructions and erection drawings.

   1. Do not field cut, drill, or alter structural members without written approval from angle frame grandstand system manufacturer's professional engineer.

B. Erect all other components of the grandstand system according to manufacturer's written erection instructions and erection drawings.

Division 14- Conveying Equipment

14 24 00 Hydraulic Elevators

Part 1- General

1.01 Elevator Requirements

A. Provide hydraulic elevator system complete and ready to operate including holeless cylinder and pump, controls car and hoist way doors.

B. Machine-roomless elevator design preferred.

C. Carefully coordinate elevator specification with Mechanical, Electrical and Fire Protection sections.

D. Where holeless elevators are specified, do not permit eccentrically loaded (single cylinder) type operation.

E. Specify both keyed and electronic keypad operation. Keypad operation is for faculty and staff.

F. Specify non-proprietary controller so it can be maintained and reprogrammed by the MSBSD Maintenance Department.

G. Specify inspections as required by the State of Alaska Department of Labor and Workforce Development Mechanical Inspection, Elevator Division (T: 1-907-269-4925) and as part of closeout documentation.

H. Obtain elevators from single manufacturer including major elevator components, including driving machines, controllers, signal fixtures, door operators, car frames, cars, and entrances, shall be manufactured by single manufacturer.

1.02 Performance Requirements

A. Comply with ASME regulatory requirements.

B. Comply with ADA-ABA Accessibility Guidelines.

C. Elevator system shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 and shall comply with elevator safety requirements for seismic risk Zone 3 or greater in ASME A17.1/CSA B44.

Part 2- Products

2.01 Elevator Description

A. Basis of Design is Machine-roomless Gen2 traction passenger elevator as manufactured by Otis Elevator Company. The system shall consist of the following components:

1. Hoistway; No machine room is provided
2. Gearless traction
3. 2500lb rated load

4. 200 fpm rated speed
5. Selective-collection automatic operation system
6. Auxiliary Operations
    a. Standby power operation
    b. Service at all floors

2.02 Car Enclosures

A. If standard cars are unacceptable, detail cars on Drawings or use an allowance and retain only those subparagraphs specifying car dimensions and describing items not included in allowance.

B. Before retaining options in “Inside Width” and “Inside Depth”, verify that selected configuration complies with requirements for providing accessibility to people with disabilities and to emergency stretchers, if required. Revise descriptions of width and depth if car has more than one entrance.

2.03 Operation Systems

A. In addition to primary operation system features, provide the following operational features for elevators where indicated:

1. On activation of standby power, car is returned to a designated floor and parked. Car can be manually put in service on standby power, either for return operation or for regular operation, by switches in control panel located at main lobby. Manual operation causes automatic operation to cease.

B. Provide the following security features, where indicated. Security features shall not affect emergency firefighters’ services:

1. The Card-Reader Operation System uses card readers at car- control stations to authorize calls. Security system determines which landings and at what times calls require authorization by card reader. Provide required conductors in traveling cable and panel in machine room for interconnecting card readers, other security access system equipment, and elevator controllers. Allow space as indicated for card reader in car. Provide stripe-swipe card reader integral with each car- control station.

2.04 Signal Equipment

A. Provide hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled. Fabricate lighted elements with LEDs.

B. Provide signal equipment designed for destination-based system. Fabricated lighted elements with LEDs.

C. Provide manufacturer’s standard recessed car-control stations. Mount in return panel adjacent to car door unless otherwise indicated.

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

2. Provide “No Smoking” sign matching car-control station, either integral with car-control station or mounted adjacent to it, with text and graphics.

D. Two-way voice communication system, with visible signal, which dials preprogrammed number of monitoring station and does not require handset use. System is contained in flush-mounted cabinet, with identification, instructions for use, and battery backup power supply.

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

F. Provide one hall push-button station at each landing.

1. Provide manufacturer’s standard wall-mounted units.

2. Equip units with buttons for calling elevator and for indicating desired direction of travel.

3. Equip units with buttons for calling elevator and for indicating direction of travel or destination as required by system. Provide a signaling system to verify floor selection, where destination registration is required, and to direct passengers to appropriate car.

4. Provide a dedicated phone line for handset.

Division 21- Fire Suppression

21 00 00 Fire Suppression

Part 1- General

1.01 Fire Suppression Requirements

A. Sprinkler piping may be Schedule 10 rolled iron with protective sealant on inside diameter of pipe to save funds and provide a longer warranty on wet systems, otherwise schedule 40 shall be used.

B. Design per current NFPA code for zones and sectionalization valves located in the mechanical room.

C. Avoid building design that requires dry pipe sprinkler branches.

D. Three copies of all control, fire protection, and other specialty shop drawings must be included as separate drawings with the “As-Built” Record Drawings in each of the previously mentioned formats.

E. Provide accurate device location map (2 copies), one for front entrance fire department use, and one for fire panel location.

21 07 19 Fire-Suppression Piping Insulation

Part 1- General

1.01 Fire Suppression and Insulation

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

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

21 13 00 Fire-Suppression Sprinkler Systems

Part 1- General

1.01 Scope Description

A. Provide a complete wet pipe automatic fire sprinkler system, hydraulically calculated to protect the entire facility, complete and in operating order.

B. System shall be in compliance with all applicable codes and standards, as well as the Authority having jurisdiction as defined by the NFPA.

C. Sprinklers shall provide for fire suppression for entire building, including outside roof canopies, attic areas, crawlspaces, and underfloor areas, utilizing systems compatible with the specific application.

Part 2- Products

2.01 General

A. Provide only new materials and equipment, which are standard products of a manufacturer regularly engaged in the manufacture of fire protection equipment.

B. All products shall bear the “UL” label or “FM” listing and be specifically approved for fire protection application where they are used.

C. Thin wall piping is not allowed.

2.02 Sprinklers

A. Provide sprinklers as required by NFPA 13 standards and in compliance with the UBC chapter 9 for the entire project. Sprinkler finish and style as follows:

1. In all areas with surface mounted light fixtures attached to finished suspended ceilings, provide standard spray pendant sprinklers and escutcheons to position the sprinkler deflector below the light fixture. Sprinklers and escutcheons to be chrome finish.
2. In all areas with recessed lighting flush to the suspended ceiling finish, provide recessed standard spray pendant sprinklers. Sprinklers and escutcheons to be chrome finish.
3. Sprinklers above ceilings and throughout shop and mechanical service areas shall be bronze finish, standard spray, upright or pendant type as required by the drawings.
4. Sidewall sprinklers shall be bronze finish in all service areas, and chrome throughout all public areas.
5. Dry pendant, sidewall sprinklers protecting inside freezers/coolers or outside overhangs shall be bronze finish. Application of dry type sprinklers shall comply with NFPA 13 standards and are required on all dry pipe systems where the system piping and/or sprinkler head is located in an unheated area.
6. Dry pendant sprinklers protecting entry vestibules shall be chrome finish. Dry pendant sprinklers protecting unheated areas and piped from wet pipe systems shall have an “A Length” dimension of not less than 18”.
7. Sprinkler Guards shall be of the same manufacturer and finish as the sprinkler which they are to be installed on. Red guards are acceptable for bronze sprinklers only. Chrome finish guards are required for chrome sprinkler heads.
8. Sprinklers of correct temperature rating shall be installed in accordance to NFPA 13.

9. Sprinklers for new additions of existing facilities shall match Make, Model, and finish for existing sprinklers, while complying with NFPA 13 standards, provided those sprinklers are still being manufactured.
10. Provide sprinkler wrenches for each type of sprinkler.
11. Spare sprinkler cabinet to be red sheet steel manufactured by the same company that made the sprinklers. Size the cabinet in accordance to NFPA 13 standards. Provide sprinklers for the cabinet representative of the assortment provided for the system. Mount cabinet on the wall within 60" of the sprinkler control riser.

21 30 00 Fire Pumps

Part 1- General

1.01 Quality Assurance

A. The fire pump shall be assembled by the pump manufacturer. An assembler of fire pumps not engaged in the design and construction of fire pumps shall not be considered as a fire pump manufacturer. The manufacturer shall assume "Unit Responsibility" for the complete fire pump. Unit responsibility shall be defined as responsibility for interface and successful operation of all system components supplied by the pumping system manufacturer.

B. Equipment provider shall be responsible for providing certified equipment start-up and, when noted, in the field certified training session. This pump start-up shall be by the pump manufacturer or a certified factory-trained representative per NFPA 20, Section 11-2. This start-up shall include verification of proper installation, system initiation, adjustment and fine tuning. Start-up shall not be considered complete until the sequence of operation, including all alarms, has been sufficiently demonstrated to the MSBSD or MSBSD's designated representative. This job site visit shall occur only after all hook-ups, tie-ins, and terminations have been completed and signed off on the manufacturer's start-up request form.

C. Conform to NFPA 13 and NFPA 20.

Part 2- Products

2.01 Vertical Turbine Pumps

A. Casing should be cast-iron, rated for 250 psi or 1.20 times actual discharge working pressure discharge gage, air vent, wear rings, seal flush connection, drain plug and flanged discharge.

B. The impellers shall be bronze, fully enclosed, keyed to shaft or secured with lock nut.

C. Shaft shall be stainless steel or carbon steel with bronze or stainless steel sleeve through seal chamber.

D. Seals shall consist of packing gland with minimum four rings graphite impregnated packing and bronze lantern rings.

2.02 Fire Pump Accessories

A. Eccentric suction reducer and OS&Y gate or butterfly valve on suction ride of pump.

B. Concentric increaser and check valve in pump discharge and OS&Y gate or butterfly valve on system side of check valve.

C. Fire pump bypass fitted with OS&Y gate or butterfly valves and check valve.

D. Circulation relief valve.

E. Suction pressure gage, 4-1/2 inch diameter dial with snubber, valve cock and lever handle.

F. Discharge pressure gage, with snubber, valve cock and lever handle.

G. Casing 3/4 inch relief valve.

H. Float operated automatic air release valve.

I. Flow metering system for closed loop testing.

Division 22- Plumbing

22 00 00 Plumbing

Part 1- General

1.01 General Comments

A. Drawings and specifications to be complete, detailed, and accurate so that all bidders may prepare estimates on exactly the same work and the construction may proceed with no misunderstandings on the work to be done.

B. Cross coordinate with all other Architectural Divisions. Make sure there is available power for these special items.

1.02 Codes

A. Comply with all current laws, rules and regulations of the State of Alaska Administrative Code (hereinafter referred to as AAC) for all MSBSD designs.

1.03 Designs and Project Procedure

A. The Architect and Engineer shall meet with the MSBSD throughout the completion of the design to review issues which include: locations for mechanical equipment, equipment chases, and accessibility. Available access to be provided to all control valves and VAV boxes in the ceiling space.

B. The Architect/Engineer shall submit the following with design drawings:

1. Water Systems shall include piping plans and isometric or schematic diagrams.

2. Drain Systems will have piping plans, isometrics or schematic diagrams. Indicate slope of all piping that is greater or lesser than 2%.

1.04 Specifications and Drawings

A. 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.

B. Make schematics and diagrammatic details for each project large enough to be easily read. Scale boiler room, kitchen and mechanical / electrical /MDF-IDF room plans and elevations at 1/4” minimum. Use 1/2” or larger if required to clearly show details of design.

C. On each set of plans provide an adequate identifying legend of all symbols used. Identify and define all abbreviations used on the drawings.

D. 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.

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

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

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

H. 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.

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

J. Specify installations to be made “in accordance with the manufacturer’s recommendations”.

K. Include, as a minimum, the controls schematic diagrams, sequences of operation, specifications and BAS points list. Provide printed and electronic copies of all PPCL Control Language (Appendix OM-005).

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

M. 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 to be submitted for approval only if on-site welding will be required for the project.

N. 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”

O. Show locations of duct static sensors and differential pressure sensors on drawings and labeled directly on the ceiling grid.

1.05 As-Builts (Record Drawings)

A. Accurate "As-Builts" are essential. This must be spelled out clearly in the contract documents and diligently pursued during construction by MSBSD, Architect, and Contractor.

B. MSBSD requires three (3) hard copy sets of Record Drawings turned in for record purposes. Two of these shall be submitted on Architectural D size (24x36 inches) paper and one half size copy and one (1) copy electronically.

1.06 Operation and Maintenance Manuals

A. Electronic (PDF) copies of all O&Ms are to be provided along with two (2) hard copies O&M manuals.

B. Include procedures for startup, shutdown 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.

C. Include a schedule of manufacturer's recommended Preventative Maintenance (PM) procedures. The PM schedule must be a standalone document that can be used independent of the rest of the O&M submittal.

D. Preventative Maintenance schedule must be provided in Excel spreadsheet format (and electronically) to include specific make, model and room location of equipment. Maintenance Instructions must include instructions for minor repairs that can reasonably be performed by persons qualified to operate the equipment and perform day-to-day maintenance. Require inclusion of all information necessary to maintain equipment, especially noting items required to keep warranties in effect.

E. Require inclusion of manufacturer's descriptive literature for all equipment in final O&Ms and all shop drawings of specially fabricated items in final corrected shop drawings.

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

G. Require a valve directory listing valve number, type, size, function and normal position for each numbered valve.

H. Require coordination of required training for MSBSD personnel with specific instruction in the provided and approved Preventative Maintenance procedures, Maintenance Instructions for minor repairs and the final Operations and Maintenance Manuals.

1.07 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 to be able to operate, maintain, repair or replace such equipment or item without disassembly or damage to the surrounding installation.

B. Consider the use of lifting hooks for heavy equipment and the need for larger access doors to upper areas with larger equipment.

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

D. All equipment must have OSHA compliant access, including ladders, cat-walks, safety rails, doors, etc. and power and light capability when directed by MSBSD.

1.08 Shop Drawings

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

B. At a minimum, 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 including drives
12. Fire protection systems
13. Valves

1.09 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, for accessibility requirements.

B. Provide access to equipment, valves and controls in spaces for maintenance personnel making routine visits to the building. Locate 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. Undesirable 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 5’ ’0” space around or between machinery and equipment.
3. Vertical access ladders.
4. Access via crawl space.
5. Ceiling mounting of equipment requiring servicing. Note MDF/IDF rooms cooling requirements in architecture section.
6. Difficult or dangerous access to lubrication points.
7. Gauges and thermometers in locations that is hard to see or read.

8. Inaccessible main utility valves.
9. Insufficient lighting.
10. Heat buildup due to poor ventilation.

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

F. Provide escape exits where required by code.

G. Provide doors, removable panels, and pathways of sufficient size to allow removal and replacement of all mechanical equipment in fan rooms, boilers and within the structure.

1.10 Pipe and Duct Penetrations

A. Design and detail all utility pipes penetrating exterior walls with sufficient flexibility for all normal settling of 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 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.

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

1.11 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. Include a sufficient number of additional appropriate sized access doors and panels besides those shown on the drawings to cover situations not anticipated during design, but requiring access due to the installed location.

D. 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 and/or its access.

E. 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.

Part 2- Products

2.01 General

A. Provide incoming water meter as required by all applicable codes including local / municipal code.

B. Provide 1/4 turn full port ball type isolation valves for each plumbing group. Provide minimum 12" x 12" access doors to all valves that are otherwise inaccessible.

C. Cleanouts must be properly placed, capped and noted on As-builts. Provide minimum of one cleanout outside building and note on As-builts. Provide access to all cleanouts, including carpeted areas. Do not put cleanout in crawlspaces unless it is within 10' of an opening large enough to bring in 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. Prefer cleanouts to be in wall approximately 2 feet above ground floor, rather than in floor under floor finish.

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. Prime all traps with water so no sewer smells come from the drains.

F. Hose Bibbs

1. Provide interior valves for all exterior frost proof hose bibbs.

2. Provide vacuum breakers on all hose bibbs.

3. Provide hose bibbs every 100 linear feet around building perimeter. Provide for drain down of water supply lines not used during winter months. Provide isolation valves for each hose bibb. Deviations from preferred hose bibb placement around building are to be approved by MSBSD.

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

H. Provide isolation valves within 5' of unit heaters.

I. Provide clean, safe, DEC certified drinking water. This requires the full spectrum test that will include lead/copper, total coli form, asbestos, inorganics, nitrates, nitrites, VOC, pesticides and arsenic. Prefer the use of HDPE (High Density Polyethylene) pipe from well or water source to building.

J. All drains are to be primed with water as part of closeout procedures prior to building occupation.

K. All plumbing/heating fixtures, pumps and appliances must provide adequate isolation valves for maintenance repair or replacement.

L. Do not locate any valves in public spaces, but rather behind lockable access doors or in mechanical spaces accessible only to maintenance personnel.

2.02 Undesirable Pipe Locations and Connections

A. The following conditions are considered undesirable:

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 parts.

3. Soil or waste lines over food processing and preparation areas or in 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 the domestic water system and water which may be contaminated, except under certain conditions where backflow prevention devices are installed.

2.03 Strainers

A. Provide 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. Provide isolation valves and drain valves with hose fittings on strainers.

B. Cover purging of lines and cleaning of strainers, at completion and before acceptance, in each division.

2.04 Unions, Couplings and Nipples

A. Aquatherm is the preferred manufacturer, no approved substitute.

B. Provide 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.

C. 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.

D. Specify isolation flanges and ball valves for equipment that may have to be removed or replaced.

2.05 Changes in Sizes of Pipe Lines

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

2.06 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.

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. An 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.

22 05 16 Expansion Fittings and Loops for Plumbing Piping

Part 1- General

1.01 Expansion Compensation

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.

22 05 29 Hangers and Supports for Plumbing and Piping Equipment

Part 1- General

1.01 Pipe Supports

A. Support all pipes with common trapeze type hangers where possible. Comply with current seismic regulations.

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

C. Refer to manufacturer's specs for supports for plastic piping.

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

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.

22 05 48 Vibration and Seismic Controls for Plumbing and Piping Equipment

Part 1- General

1.01 General Requirements

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

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 the building system it serves.

22 05 53 Identification for Plumbing and Piping and Equipment

Part 1- General

1.01 General Requirements

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

B. Identify all equipment with painted stenciled letters or engraved plaques 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. Label equipment left to right. Boilers should be labeled left to right when facing the burner access panels.

E. Label all unit heaters and corresponding electrical panels.

F. 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.

G. Provide labeling directly on ceiling grid for all above ceiling equipment including valves, VAVs, etc. with color coordinated sticker dots.

H. Labeling of mechanical directly on ceiling grids.

22 10 00 Plumbing Piping and Pumps

Part 1- General Comments

1.01 Requirements

A. Use only Aquatherm pipes for domestic water supply within the building. Any soldered joints shall be lead free and in conformance with the current plumbing code. Flux, shall be code compliant B813 water soluble.

B. No Victaulic or mechanical fittings permitted except in the sprinkler systems or elevator.

C. All tubular pipes to be 17 gauge or better.

Part 2- Products

2.01 Pipe and Piping Products

A. Manufacturer shall be Aquatherm. No substitutions.

2.02 Valves

A. Acceptable Manufacturer is Aquatherm. No substitutions.

B. Isolation Valves

1. All isolation valves to be full port ball valves, up to 4”, larger valves to be gate valves, no butterfly valves.

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

3. Provide valves for isolating all service parts of mechanical piping systems, equipment and controls. Isolate separate floors, separate wings, all branches off of mains, toilet rooms, machinery rooms, all heating zones, and other natural subdivisions of the building. Provide isolation valves.

4. Show all valves on the drawings. Do not rely on a general note in the specifications or on the plans to “install valves ‘where’ or ‘as’ required.”

5. Make toilet room isolation valves accessible through locked ceiling hatch in restroom or inside janitor’s closet.

6. Do not provide separate isolation valves/balancing valves as isolation valves for isolation.

C. Relief Valves

1. Provide relief valves wherever required by code. The set pressure should be indicated on the valve and have externally operated level lift handles. Provide floor drain nearby for potential spills.
2. Specify ASME certified relief valves to comply with boiler code or Unfired Pressure Vessel Code.
3. Provide discharge piping or relief valves to glycol make up tank if glycol is use or if water, 6 inches HTF provided a floor drain is nearby.

D. Boiler Drain and System Piping Drains

1. Use ball valves with hose end and cap.

Part 3- Execution

3.01 Fusion Welding of Joints

A. Install fittings and joints using socket-fusion, electrofusion, or butt-fusion as applicable for the fitting type. All fusion-weld joints shall be made in accordance with the pipe fitting manufacturer's specifications and product standards.

B. Fusion-weld tooling, welding machines and electrofusion devices shall be as specified by the pipe and fittings manufacturer.

C. As few number of flanges as possible shall be used to prevent leaks.

D. Joint preparation, setting and alignment, fusion process, cooling times and working pressure shall be in accordance with the pipe and fitting manufacturer's specifications.

3.02 Valve Applications

A. Install gate valves close to the main on each branch and riser serving two or more plumbing fixtures or equipment connections and where indicated.

B. Install gate or ball valves on the inlet to each plumbing equipment item, on each supply to each plumbing fixture not having stops on supplies, and elsewhere as indicated.

C. Install drain valves at the base of each rise, at low points of horizontal runs, and where required to drain the water distribution piping system.

D. Install ball valves in each hot water circulating loop and on the inlet and discharge side of each pump.

3.03 Pipe Installations

A. Install hangers and supports at intervals specified in the applicable Plumbing Code or as recommended by pipe manufacturer.

B. Fire stopping shall be compatible with the Aquatherm Piping and meet the requirements of ASTM E 814. Pipe insulations or fire resistive coating shall be removed where the

pipe passes through a fire stop and, if required by the fire stop manufacturer, for 3 inches beyond the fire stop outside of the fire barrier.

22 30 00 Plumbing Equipment

Part 1- General

1.01 General Requirements

A. Each lab, shop and art room sink must have a plaster/clay trap with easy access and clean out.

B. Refill of any and all water tanks must be normally closed slow acting control fall.

1.02 Water Heaters

A. Domestic hot water temperature system to provide 140°F for sanitary purposes, i.e. dishwashers, kitchen equipment, etc. Provide a tempering valve to reduce temperature down to 120°F throughout the rest of the building. The recirculation line pipe shall be to manufacturer's specifications. Both temperatures shall be monitored by the BAS control system.

B. Where the heating system is gas, 2 standalone natural gas fired water heaters are preferred. Each should provide 100% of the domestic hot water load for that building so each could be used as backup.

C. If an indirect fired water heater is being considered as an alternate to the standalone heaters, provide a 40 gallon electric water heater in a custodial area. This will provide domestic hot water for custodial use during summer shutdown of the boilers.

D. Where the main system is to be fuel oil fired boilers and an indirect fired water heater is being considered, 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.

E. If an indirect water heater is being used, the supply and return lines for heating that unit will tie into the boiler primary loop with a circulating pump to provide heat to water heater.

F. When an oil fired water heater is being used provide 4 foot of clearance around and 5 foot on top of unit for maintenance. This will enable pulling the top off and doing tube cleaning.

G. Provide water heaters with BAS start/stop capabilities along with points to schedule start/stop times.

H. Provide domestic hot water recirculation pump with BAS start/stop capabilities along with points to schedule start/stop times.

I. Provide BAS points for each water heater supply temp.

22 35 00 Special Exhaust Systems

Part 1- General

1.01 Laboratory Fume Exhaust and Fume Hoods

A. Provide spaces designated for use as laboratories with provisions for exhausting fumes to the outside, consisting of fume hoods or special exhausts in the room, connected by ducts to an exhaust fan on the roof of the building.

B. Combine several hoods in a building into fume hood exhaust systems, with one exhaust fan serving the system. All fume hoods on any one exhaust system shall have the same supply fan. Consider these fume hood exhaust systems a part, or all of, the building heating and ventilating exhaust system, as they operate continuously. Provide manual control at each fume hood. Size fume exhaust ducts for a transport velocity consistent with design noise levels, duct static pressure and size limitations.

C. All standard chemical fume hoods are designed for a minimum face velocity of 125 feet per minute through the clear opening.

D. Locate fans so that a negative pressure exists in all fume hood ducts within the building. Where fans cannot be located to satisfy the above, check the locations with MSBSD for approval and precautions to take.

E. Show flexible connections made of neoprene, coated glass fiber cloth at all fan connections to ducts.

1.02 Industrial Exhaust Systems

A. Design industrial exhaust systems for woodworking machinery, grinders, dust collecting, paint spraying or welding fumes, etc., with adequate provisions for entrapment and safe removal of any dangerous substances.

B. Use methods and duct velocities as recommended in the Industrial Ventilation Manual as published by American Conference of Governmental Industrial Hygienists, latest edition.

C. Welding lab station exhaust must conform to all applicable codes including OSHA for welding fume exhaust velocity. Weld lab ventilation system must be separate from general building return air system. During operation of lab, the lab must have a slight negative pressure so fumes will not escape out into the common areas.

22 40 00 Plumbing Fixtures

Part 1- Products

1.01 Plumbing Fixture Products

A. Reference in the specifications and shop drawings any existing mechanical or electrical equipment shown on the plans, or specified as being furnished by the MSBSD.

B. Reference in the specifications and the shop drawings: existing location, and when necessary, who disconnects, moves, and reconnects in the new location, and if any new equipment is needed for re-installation in the new location.

C. Lavatories shall have countertops that are self-rimming, shall be constructed of type 302 (18.8) nickel bearing stainless steel with interior and top surfaces polished. All sinks to be thoroughly sound deadened. Bowls to be punched to receive type J15SSF nickel bearing stainless steel drain with flat strainer and 1.5 inch O.D. tailpiece.

D. Lavatories shall be wall hung, shall be constructed of vitreous china with 4 inch back splash and drilled for 4 inch faucet centers. Specify with concealed arm carrier.

E. All toilet and urinals shall have approved flushometers. Use flush valves with exposed body on toilets and urinals. The use of infrared switched flush valves is not encouraged.

F. All faucets must be certified lead-free.

G. Science Lab Faucets shall be high gooseneck with convertible swing spout and vacuum breaker and serrated nozzle multipurpose turret, gas/water.

H. Check with MSBSD for garage faucet requirements.

I. Triple Bowl Sink Faucet shall be lead-free double jointed swing spout

J. Classroom Countertop Bubblers shall be lead-free with volume control.

K. Provide fully recessed drinking fountains. “No drinking coolers”

L. Drinking Fountains shall be (Non-Refrigerated) push button where no HCP required.

M. Shower stalls shall be Fiat 39” x 39” OD ADA accessible for handicap stalls. Alternate accessible shower stall designs will be considered and discussed with MSBSD.

22 45 16 Eyewash Equipment

Part 1- General

1.01 Requirements

A. Dual Head in Science Rooms. All eyewash stations shall be installed in compliance with Federal, State and local codes, including location, temperature control, etc. Because of the type of chemicals used, eye wash stations are needed in one (1) centralized custodial closet on each floor, science prep and MSBSD kitchen; in addition to those normally put in science and vocational labs.

Division 23- Heating, Ventilating, and Air Conditioning (HVAC)

23 00 00 HVAC

Part 1- General

1.01 General Comments

A. Coordinate with all other Architectural Divisions for ventilation purposes. For example, consider the exhaust requirements of Food Service Equipment, Nurse's Room and Restroom exchange fans.

B. Provide the Architect with supply and exhaust air duct sizes and duct shaft space requirements as soon as possible to allow Architect to provide for adequate interstitial space.

C. Design ventilation system for acceptable indoor air quality. Comply with ANSI/ASHRAE standards for approved IAQ.

D. Provide CO2 monitoring and control for occupied spaces.

E. Provide CO monitoring with variable control at the fresh air intake.

F. Heat pickup by ventilation air passing through plenums or ductwork should be kept 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 bearing in mind the MDF and IDF closets must be kept cool enough to not harm equipment. 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 through hot spaces.

1.02 Summary

A. No terminal equipment controllers or fan coil units will be placed in classrooms. Primary heating system will be designed with water as the heating medium. Areas that need freeze protection such as preheat coils will be on separate glycol loops served by a plate-type heat exchanger.

B. 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.

C. Arrange and locate fan rooms and ductwork 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, if required, to prevent heat transmission to adjacent spaces. Provide access from interior of building.

D. In determining heating and ventilating air quantities to be circulated in a space, consider all the following factors:

1. Fresh air intake controlled by measured CO2 levels
2. Air required per occupant basis for the entire building
3. Air required to heat or cool the space
4. Make-up air required for non-recirculated spaces, fume hoods, kitchen hoods, rest rooms, shower rooms, locker rooms, or other special exhausts
5. Air required for combustion in fuel burning equipment

E. Report air changes rates exceeding 10 air changes per hour or 3 CFM per square foot of floor area to the MSBSD for possible approval of mechanical cooling.

F. Provide mechanical ventilation (exhaust) for trash rooms, janitor rooms, restrooms, mechanical equipment rooms and electric rooms as follows:

1. Exhaust only for trash rooms, janitor closets and restrooms, providing a slight adjustable negative pressure in the room to confine odors.
2. Provide sufficient supply and exhaust ventilation to mechanical equipment rooms to prevent temperatures above 90°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.

1.03 Codes

A. Comply with all current laws, rules and regulations of the State of Alaska Administrative Code (hereinafter referred to as AAC) for all MSBSD designs.

1.04 Designs and Project Procedure

A. The Architect and Engineer shall meet with the MSBSD at the completion of the schematic design phase to review issues which include: locations for mechanical equipment, equipment chases, and accessibility. Available access to be provided to all control valves and VAV boxes in the ceiling space. Maximize heat recovery during air exchange to maintain indoor CO2 standard.

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

1. Peak heating design conditions, the data shall use the latest version of ASHRAE guides.
2. The total annual energy budget for a nine month Elementary School shall not exceed 70,000 BTU per square foot per year. The total annual energy budget for a nine

month operation of a junior high school shall not exceed 75,000 BTU per square foot per year. The total annual energy budget for a nine month operation of a high school shall not exceed 85,000 BTU per square foot per year. The total annual energy budget for a 12 month operation of all other facilities shall not exceed 110,000 BTU per square foot per year.

3. 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. Locate air intake vents away from vehicle parking/traffic.
4. Keep condensing units for walk-in freezers, coolers and air conditioners inside the building while providing adequate ventilation and access for maintenance.

1.05 Specifications and Drawings

A. 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.

B. Make schematics and diagrammatic details for each project large enough to be easily read. Scale boiler room, kitchen and mechanical / electrical /MDF-IDF room plans and elevations at 1/4” minimum. Use 1/2” or larger if required to clearly show details of design.

C. On each set of plans provide an adequate identifying legend of all symbols used. Identify and define all abbreviations used on the drawings.

D. 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.

E. 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.

F. Show all mechanical service and meter equipment and locations. 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.

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

H. 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.

I. 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.

J. Specify installations to be made “in accordance with the manufacturer’s recommendations”.

K. Include, as a minimum, the controls schematic diagrams, sequences of operation, specifications and BAS points list. Provide printed and electronic (PDF) copies of all PPCL Control Language. Refer to Integrated Automation Division 25.

L. 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 to be submitted for approval only if on-site welding will be required for the project.

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

N. 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”

O. Show locations of duct static sensors and differential pressure sensors on drawings and labeled directly on the ceiling grid.

1.06 As-Builts (Record Drawings)

A. Accurate "As-Builts" are essential. This must be spelled out clearly in the contract documents and diligently pursued during construction by MSBSD, Architect, and Contractor. Copy of redlines maintained on site during construction and updated daily for all trades/disciplines.

B. MSBSD requires three (3) hard copy sets of “As-Builts” turned in for record purposes. Two shall be submitted on Architectural D size (24x36 inches) paper and one half size copy.

C. A digital copy of all “As-Built” Record Drawings shall be provided.

1.07 Operation and Maintenance Manuals

A. Verify specific Operation and Maintenance (O&M) Manual requirements particular to each section are included in those sections that have such particular requirements.

B. Electronic (PDF) copies of all O&Ms are to be provided along with hard O&M copies.

C. Include a schedule of manufacturer's recommended Preventative Maintenance (PM) procedures. The PM schedule must be a standalone document that can be used independent of the rest of the O&M submittal.

D. Preventative Maintenance schedule must be provided in Excel spreadsheet format (and electronically) to include specific make, model and room location of equipment. Maintenance Instructions must include instructions for minor repairs that can reasonably be performed by persons qualified to operate the equipment and perform day-to-day maintenance. Require inclusion of all information necessary to maintain equipment, especially noting items required to keep warranties in effect.

E. Require inclusion of manufacturer's descriptive literature for all equipment in final O&Ms and all shop drawings of specially fabricated items in final corrected shop drawings.

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

G. Require a valve directory listing valve number, type, size, function, normal position for each numbered valve and location.

H. Require coordination of required training for MSBSD personnel with specific instruction in the provided and approved Preventative Maintenance procedures, Maintenance Instructions for minor repairs and the final Operations and Maintenance Manuals.

1.08 Access

A. Access for operation, maintenance, repair or replacement of any equipment or device is integral. Mechanical access will be located in common areas. Access to operate, maintain, repair or replace such equipment or device without disassembly or damage to the surrounding installation is required.

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 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. Consider the use of lifting cranes for heavy equipment and the need for larger access doors to upper areas with larger equipment.

C. Pay particular attention to access and clearance for all main, distribution, or control, panel boards, equipment racks and enclosures. Refer to all applicable codes for working clearances for all main, distribution, or control, panel boards, equipment racks and enclosures.

D. Provide power and lighting to required maintenance access areas

1.09 Shop Drawings

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

B. At a minimum, 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 including drives
12. Fire protection systems
13. Valves

1.10 Existing Equipment

A. Reference in the specifications and shop drawings any existing mechanical or electrical equipment shown on the plans, or specified as being furnished by the MSBSD.

B. Reference in the specifications and the shop drawings: existing location, and when necessary, who disconnects, moves, and reconnects in the new location, and if any new equipment is needed for re-installation in the new location.

1.11 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 previous for accessibility requirements.

B. Provide access to equipment, valves and controls in spaces for maintenance personnel making routine visits to the building. Locate 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. Undesirable 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 4’ ’0” space around or between machinery and equipment.
3. Vertical access ladders unless properly caged.
4. Access via crawl space.

5. Ceiling mounting of equipment requiring servicing. Note MDF/IDF rooms cooling requirements in architecture section.
6. Difficult or dangerous access to lubrication points.
7. Gauges and thermometers in locations that is hard to see or read.
8. Inaccessible main utility valves.
9. Insufficient lighting.
10. Heat buildup due to poor ventilation.
11. Less than 4’ 0” space around network equipment.

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

F. The locations of access doors, electric panels, fire exhaust cabinets, dry standpipe valves, convector or supply and exhaust grilles, etc., in areas of public access are to be reviewed with MSBSD for approval of appearance as related to other parts of the structure.

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

H. Provide doors, removable panels, and pathways of 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 accessible only to maintenance personnel.

I. Cabinet heaters must have valves located in the cabinet for easy access.

1.12 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.

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.

1.13 Machinery Guards

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

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

1.14 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. An 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.

Part 2- Products and Execution

2.01 Air Conditioning and Cooling

A. Air conditioning for occupant comfort only, will not ordinarily be authorized for MSBSD facilities.

B. MDF and IDF rooms must have proper cooling with requirement that no liquids or condensation can interact with vital electronic equipment. Dedicated drainage systems also required.

2.02 Recirculation

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

1. Noxious laboratories or rooms
2. Art rooms
3. Rest rooms
4. Trash and garbage rooms
5. Custodial closets
6. Copy/work rooms using volatile solvents

7. Mechanical rooms
8. Electrical rooms
9. Kiln Rooms

B. Discuss with MSBSD other areas where recirculation of exhaust air may be a health hazard.

C. Where recirculation is used, install smoke detection required by code.

23 05 53 Identification for HVAC Pumping and Equipment

Part 1- General

1.01 MSBSD Circulation Pump Numbering System

10-19	Boiler pumps (blend, boiler, etc)
20-29	System Pumps
30-39	Secondary pumps (glycol)
40-49	Domestic hot water pumps
50-59	Well Pumps
60-69	Septic Pumps

23 05 93 Testing, Adjusting, and Balancing

Part 1- General

1.01 Testing Requirements

A. Include tests of all mechanical and electrical installation 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.

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

1.02 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 MSBSD at least two (2) working days in advance.
2. MSBSD will arrange for the shutdown on requested time and date, if possible, or on alternate agreed time. Contractor shall be responsible for all work, such as splicing, tie-ins and connections shown on the drawings.

3. Schedule and execute work that will cause major shutdowns to be done after normal school hours or on weekends unless approved otherwise.
4. Have adequate workers, materials and equipment available at approved scheduled time to complete work and reestablish service with the least interference to operations.

23 07 13 Duct Insulation

Part 1- General

1.01 Summary

A. Outside air, relief air, combustion air, and exhaust air ducts shall have an average thermal conductivity of k=0.23 at 75°F mean temperature. All duct insulation shall meet the flame spread and smoke development rating requirement of NFPA 90A Foil-Scrim-Kraft (FSK) outer jacket not acceptable. 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.

23 07 19 HVAC Piping and Insulation

Part 1- General

1.01 Cold Pipe Insulation

A. Domestic cold water, vents through roof, rain leaders and other cold piping, not including 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/degree @ 100 f. mean temperature. The insulation shall have a factory applied vapor barrier, flame-retardant, all service jackets.

B. All pipe sizes = Insulation shall be 1/2” thick minimum.

1.02 Hot Pipe Insulation

A. All pipe sizes = Insulation shall be minimum 1” thick.

23 09 00 Instrumentation and Control for HVAC

Part 1- Products

1.01 Gauges and Thermometer

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. Temperature sensors connected to BAS 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. Provide common header supply and return temps in addition to individual boiler sensors.
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 midscale 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. All T-stats are to be occupant adjustable.

1. Filter Differential Pressure Gauges
    a. Specify direct reading differential pressure gauges of the range appropriate for the pressure drop being measured.
    b. Specify one gauge for each filter bank.
2. Thermometers
    a. Specify direct reading thermometers on both the supply and return hot water heating headers.

1.02 Meters

A. Meter the mechanical and electrical utility and water services to each building.

B. Additional sub-metering may be requested by the MSBSD for special subdivisions within the building.

23 09 13.33 Control Valves

Part 1- General

1.01 Control Valves

A. Control valves will be placed in the chase or above the ceiling and must have access for fin tube and baseboard radiation.

23 09 23 Direct-Digital Control System for HVAC

Part 1- Design Criteria

1.01 Direct Digital Control

A. We prefer PID tuning loops in our control program language where applicable.

B. Specify the DDC system to perform the following functions:

1. Furnish power for sensors and controls up to and including interposing relays.
2. Convert and store in a common format measurements received from the instruments.
3. Monitor status of equipment items.
4. Provide for remote readjustment of control equipment.
5. Perform preliminary processing and analysis of selected measurements.
6. Encode and decode messages to ensure secure, reliable transmission between the DDC and remote equipment.
7. Self-testing via diagnostics with complete exerciser capability.
8. Provide interface communication with the building fire alarm system.
9. Design system for freeze protection. For example, outside air dampers would fail closed and heating valves would fail open.

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 classrooms where possible. VAV boxes should have a minimum 6” access door before and after heating coil.

D. Application Specific Controls

1. Control of central HVAC systems and equipment
2. Built-up air handling systems
3. Terminal control units (VAV Boxes). Provide discharge sensors.
4. Damper actuators
5. Valve actuators
6. Site lighting control
7. Hockey rink lighting control
8. Electrical phase loss/phase reversal
9. KWH/KWD monitoring
10. Generator- Run status and Common alarm
11. Security

12. Fire alarm

13. Common alarm

1.02 Equipment Control

A. Boilers

1. Enable and disable functions shall be manual, by the operator

2. Monitor boiler flame failure, run status, start/stop

B. Hydronic System Hot Water Circulating Pumps

1. Provide circulation to all heat exchangers to keep all heat exchangers at a minimum of 120°F. Do not allow heat exchangers to warm and cool. Monitor points.

2. Do not specify pump S/D for outdoor rest, provide lag pumps for back-up and alternate operation.

3. Provide equal run times for each pump. Provide both lead/lag alarm and pump alarm for the failed pump. Provide a critical failure alarm should both pumps fail.

C. Supply Air Fan

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

Part 2- Heating and Ventilating Controls

2.01 General Controls

A. General preliminary design for heating and ventilating control systems shall include provisions for full automatic control.

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

C. The electronic system, DDC – Landis, shall be completely transparent with MSBSD's existing hardware and software. Coordinate with the Electrical Engineer the size and installation of the control and monitoring cable conduits from each mechanical room, remote, or roof equipment, to the building control station location. Locate the control panels on the plans to avoid interference with other mechanical. Modular design control panels are not acceptable (modular building controller, network control unit).

D. Show control diagrams on the drawings. Show specific size and routing of all cable conduits from each device to the building control station location.

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. Provide night heat setback parameters which can be fully programmed and controlled through the DDC.

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

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

I. Use wall mounted thermostats.

J. Specify bulb type, 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.

K. Show thermometers near each controlled point for setting of the control and checking its operations.

L. Show pressure gauges in the main and branch air lines to each major air operated control element. Pneumatics not acceptable.

M. Specify system to operate as a low-voltage multiplexed data system, with operator console communications with BAS over the serial data trunk, and a combination of electric control equipment. Design system so a failure of the BAS shall cause all heating applications to go to full heat.

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

O. Specify all programming to be included to implement the controls sequences and to implement the systems and features in the host BAS system.

P. Specify the MSBSD Host CPU, located at the MSBSD Maintenance Facility, to be updated to include all controls installed under this design.

Q. Require that all control points be demonstrated to the MSBSD and engineer at substantial completion. The Engineer is required to witness operation of all control points.

R. Specify electronic devices for the following applications:

    1. Static Pressure Switches for the following:

        a. Control air pressure high/low alarm.

        b. Air duct static pressure high/low alarm.

        c. Use current sensor on pump vs. differential pressure switches.

        d. Fan status monitoring.

        e. Filter pressure monitoring.

2. 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. Do not place before fan. Mixing is needed to prevent nuisance lockouts.

   f. High limit Thermostats (fire stats, etc.): Rod and tube type elements

   g. Duct type smoke detectors: Dual chamber ionization type smoke detectors listed by UL for specific use in air handling systems.

23 11 00 Facility Fuel Piping

Part 1- General

1.01 Piping

A. Fuel oil piping shall be welded black iron for all pipe 2 inches and larger; threaded black iron 3/4 inch up to 2 inches, and brazed or flared type L or K copper for tubing smaller than 3/4 inch 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 MSBSD approved equal.

23 13 00 Facility Fuel-Storage Tanks

Part 1- General

1.01 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 BAS monitoring system. Tank will have a rupture/leak containment outer tank and necessary access for emergency manual fill. See Section 23 11 00 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.

C. Method of fuel storage is project and site specific. This should be reviewed and approved with the MSBSD as part of the design development. Above ground storage is preferred.

23 20 00 HVAC Piping and Pumps

Part 1- Products

1.01 HVAC Pumps

A. Circulating pumps shall be Grundfos or MSBSD approved equal.

B. Variable frequency drives required for all heating pumps 3 HP or greater.

C. Provide two separate pumps, Lead/Lag alternating are required for each pump application. Do not specify double headed pumps. Include separate check and isolation valves on each pump assembly for service. Show pressure gauges of suitable range at the suction and discharge of each pump.

D. Specify bypass valves, such as Honeywell Braukmann or MSBSD approved 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.

23 21 00 Hydronic Pumping

Part 1- General

1.01 Design Criteria

A. Manufacturer shall be Aquatherm or MSBSD approved equal.

B. Hydronic piping shall be routed in the ceiling spaces, utilidors or mechanical chase above the room served.

C. 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. Aquatherm for all heat piping up to 4 inches, including headers. Use schedule 40 threaded or welded steel above 4 inches.

D. 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.

E. Provide 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. Ex. Spiro Top.

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

G. Any serviceable devices must have ball valves to isolate device for maintenance.

H. Provide ball valves on all hydronic piping exiting or entering boiler room or to separate floors, fan rooms or branch zones.

1.02 Hydronic Specialties

A. Expansion Tanks

1. 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.

2. The diaphragm shall be butyl rubber or other material suitable for use with corrosion inhibitors. The factory pre-charge shall be 12 psig.

3. Do not use plain steel compression tanks. Each tank shall have separate isolation ball valves (full port) and valve drain taps.

4. Acceptable manufacturers are B & G, Amtrol, Taco, Armstrong or MSBSD approved equivalent.

B. Make-up Water Assembly

1. The make-up water assembly shall be a bronze pressure regulating valve set at the pressure required to maintain system filled above highest point.

2. Specify Watts 900 series backflow preventer where code permits, with Watts pressure reducing valves.

3. Make-up water assembly shall have a valved line to by-pass pressure regulator. A water meter will be located before the bypass/regulator pipe the pressure regulator/bypass valve piping. Provide water filter on boiler feed water system. 10 micron.

C. Boiler Water Treatment

1. Boiler water shall be chemically cleaned and flushed under the supervision of a water treatment specialist.

2. After cleaning and flushing, system shall be chemically treated for corrosion with a nitrate based material compatible with what the MSBSD is now using at a level recommended by the water treatment specialist.

3. The MSBSD is currently using corrosion prohibitor 6439 product as our standard.

4. Throughout the cleaning and treatment of the system samples will be taken and a report issued by the water treatment specialist.

D. Low water cutoff will be McDonnell-Miller Series with manual reset or as specified by boiler manufacturer design or MSBSD approved equal. Install auto air vent with shut off valve on low water cut off column. Ex. Spiro Top.

E. Glycol Pump shall be Gould A03WS, BF035 or JOWLS with Square D pressure switch and expansion tank, or MSBSD approved equal.

F. Heat Transfer Medium will use Dow Frost Safe-T-Therm propylene glycol based system or MSBSD approved equal. Require permanently dyed glycol for quick identification with freeze factor of -25 degrees as seen on refractometer.

G. Plate Type Heat Exchangers shall be Graham or MSBSD approved equal.

H. Install air bleeders in mechanical room and fan rooms. Use Spiro Top or MSBSD approved equal.

I. Balancing Valve shall be B & G Circuit Setter II, Taco or MSBSD approved equal.

J. Air Separator shall be Spirovent or MSBSD approved equal. Air Separator should eliminate 99.6% of system air and 80% of a 30 micron particle size and larger within a 100 passes.

K. VFD Flow Control shall be Griswold.

L. Use only approved ball valves with MIP by Hose adapter on boiler with cap. No light duty boiler drains. No cast pressure reducing valves.

23 27 13 Diffusers, Registers, and Grilles

Part 1- General

1.01 Diffusers and Grilles

A. Coordinate supply air register, diffusers and return air grills with Architect to ensure comparability with design.

B. Select type and design characteristics from the latest manufacturer's data.

C. 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.

23 31 00 HVAC Ducts and Castings

Part 1- General

1.01 Duct System Design

A. In addition to the codes and standards addressed elsewhere, the following Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) in the latest edition or revision of the codes and standards apply:

1. HVAC Duct Construction Standards, Metal and Flexible
2. Industrial Duct Construction Standards
3. 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 A525. Ductwork shall comply with UL 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.

E. Round ducts shall have a metal thickness in accordance with SMACNA with all seams and joints constructed to specifications. 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. 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. (water column) positive and negative.
3. For double wall plenums for any type system: 6 inches W.C. positive and negative.

H. 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. Support the flexible duct at connections to air outlets or returns to maintain minimum recommended bend radius.

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

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

J. 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.

1.02 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 fan. Reduce this velocity to minimum acceptable as air quantity and pressure decreases in relations to distance from fan.

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

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

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

E. 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.

1.04 Access Panels and Doors (Ventilation) and Fire Dampers

A. Provide access to fire dampers to accommodate technician to maintain.

B. Show sufficient access panels, at accessible locations in ducts, to permit cleaning interiors. Pay particular attention at points where ducts are directly connected and at any point in range hood exhaust duct where grease could accumulate.

C. 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

D. 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.

23 33 00 Air Duct Accessories

Part 1- Products

1.01 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 MERV 8 or better, 30-35%.

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.

h. Provide filter size and amount needed on AHU by filter bay.

23 33 13 Dampers

Part 1- General

1.01 Dampers Requirements

A. 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.

B. 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.

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

D. 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 occupied areas.

E. If fire dampers are used in design, all fire dampers must be MSBSD approved. 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' or 'as' required by applicable codes."
3. Specify fire or fire/smoke dampers meeting one of the following requirements:
    a. UL 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.
    c. Resettable fusible link fire dampers are preferred.
4. Show dampers installed in an accessible location, or provide access to each fire damper for maintenance and fusible link replacement.
5. Detail fire damper installation in accordance with Sheet Metal Institute "Fire Damper Guide"

23 34 00 HVAC Fans

Part 1- General

1.01 Fans

A. Specify only fans meeting 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.

D. Separate Fans should be used when possible in the following areas to help reduce utility consumption in unoccupied spaces:

1. Main area, office area, gym, locker rooms, theater, commons, small gym/weight room, kitchen, custodian's shop, boiler room, welding shop, music and band room, drama room and art rooms.

1.02 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 nonadjustable 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.

1.03 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.

2. Specify high efficiency motors.

B. Voltage

1. Specify motors of less than 1/2 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 1/2 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 services

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

1.04 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.

2. Give special attention to bearings in any equipment that has been delivered to the job site, or installed, in advance of completion.

3. Specify bearings with a useful life of 200,000 hours.

B. Motors

1. Fit 1.5 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 1.5 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. Fans smaller than 24" will be self-aligning, provide greaseable enclosed ball bearing, with pillow block mounting.
   2. Fans larger 24" will be self-aligning and provide Babbitt lined sleeve, with ring oiling.
   3. Industrial fans (SP-27") will be heavy duty, self-aligning greaseable enclosed ball bearing, with pillow block mounting.

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

E. Special fans (forced draft, induced draft) will be discussed with MSBSD.

F. Other fans shall be 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.
      b. Install at proper elevation to indicate oil level in bearing.
      c. Extend both supply and purge pipes for greaseable ball bearings. Fit with proper lubricating fitting, and fill each pipe with proper lubricant before installing.
      d. Use clear extension tubing to be able to inspect proper bearing lubrication.
      e. Grease fittings or zerts should be accessible from outside of air handler.

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.

23 35 00 Special Exhaust Systems

Part 1- Systems

1.01 Laboratory Fume Exhaust and Fume Hoods

A. Provide spaces designated for use as laboratories with provisions for exhausting fumes to the outside, consisting of fume hoods or special exhausts in the room, connected by ducts to an exhaust fan on the roof of the building.

B. Combine several hoods in a building into fume hood exhaust systems, with one exhaust fan serving the system. All fume hoods on any one exhaust system shall have the same supply fan. Consider these fume hood exhaust systems a part, or all of, the building heating and ventilating exhaust system, as they operate continuously. Provide manual control at each fume hood. Size fume exhaust ducts for a transport velocity consistent with design noise levels, duct static pressure and size limitations.

C. All standard chemical fume hoods are designed for a minimum face velocity of 125 feet per minute through the clear opening.

D. Locate fans so that a negative pressure exists in all fume hood ducts within the building. Where fans cannot be located to satisfy the above, check the locations with MSBSD for approval and precautions to take.

E. Show flexible connections made of neoprene, coated glass fiber cloth at all fan connections to ducts.

1.02 Industrial Exhaust Systems

A. Design industrial exhaust systems for woodworking machinery, grinders, dust collecting, paint spraying or welding fumes, etc., with adequate provisions for entrapment and safe removal of any dangerous substances.

B. Use methods and duct velocities as recommended in the Industrial Ventilation Manual as published by American Conference of Governmental Industrial Hygienists, latest edition.

C. Welding lab station exhaust must conform to all applicable codes including OSHA for welding fume exhaust velocity. Weld lab ventilation system must be separate from general building return air system. During operation of lab, the lab must have a slight negative pressure so fumes will not escape out into the common areas.

23 37 00 Air Outlets and Inlets

Part 1- General

1.01 Air Outlets and Inlets

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 or other vehicles or on the ground.

B. 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.

C. 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.

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

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

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

G. 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.

H. BAS panels must communicate on RS.485 Protocol.

23 38 00 Ventilation Hoods

Part 1- General

1.01 Hood Air Supply

A. Provide adequate exhaust and supply air for any new fume hoods installed in an existing building.

B. Where the existing building system was not designed for and cannot be modified to handle the added requirements or the existing exhaust duct system is not fume resistant, provide a new exhaust and supply system.

1.02 Canopy Hoods

A. In general, canopy type hoods are not acceptable for laboratory or kitchen use.

B. When this type is proposed, the reason should be discussed with and approval received from the MSBSD.

23 51 00 Breechings, Chimneys, and Stacks

Part 1- General

1.01 Design Criteria

A. Require separate stacks for each boiler. Cast iron boilers, require rear exiting stack.

B. Chimney (stack) shall be prefabricated UL listed for application with following features:
   1. Listed for pressurized systems.
   2. Stainless steel liner and outer jacket where exposed to outdoor weather.
   3. Cleanout tee, insulating rood support, stainless steel flashing and counter flashing.

23 52 00 Heating Boilers

Part 1- General

1.01 Boiler Rooms

A. Water to be the number one transfer fluid. No modular bank packaged skid frame type boilers may be used. Variations to these design criteria are subject to MSBSD approval.

B. The heating plant shall be located to allow maintenance to the heating units without interruption of building activities. Consideration shall be given during the concept stages of the design to insure the height and access requirements of 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. Provide at least a 4' minimum unobstructed clearance for boiler service access around all components.

C. Boiler room ventilation air is to be provided using a fan that blows air into the boiler room, along with mechanically coupled OSA/RA dampers that modulate to maintain temperature. The fan should start on call for cooling. Combustion air opening should be provided, sized for the appliance combustion air requirements. Must be at least 6 feet away from any pipes.

D. 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.

E. Locate Boiler Room at ground level. No pit type mechanical room.

F. Corrosion inhibitor concentration of sodium nitrate should be 1,200 ppm upon filling boiler system.

G. 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.

23 52 16 Condensing Boilers (HE Gas Boilers)

Part 1- Products

1.01 HE Boilers

A. Acceptable Condensing Boiler (High Efficiency Gas Boiler) Manufacturer: Aerco, Thermal Solution or MSBSD approved equal.

B. Boiler should be natural gas fired, condensing fire tube design with a modulating forced draft power burner and positive pressure vent discharge.

1.02 Oil Fired Boiler

A. Manufacturer: Fulton or MSBSD approved equal

23 52 23 Cast-Iron Boilers

Part 1- General

1.01 Boiler Requirements

A. Acceptable Cast Iron Boiler Manufacturers are Burnham, Weil McLain or MSBSD approved equal.

1. The MSBSD 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 UL/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 Building Automation System, for example, relays for on/off control or 0.10V/4.20Ma inputs.
4. Firing control should be fully modulating.
5. Provide separate step down gas regulators on the gas train for each unit; for example, regulate 2lb. gas to inches. Test ports required before and after regulators.
6. Indicators and Alarms should indicate 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 for BAS.
7. Provide supply and return temperature wells for Building Automation System. Also provide boiler pressure sensors for primary and secondary loops.

B. Power flame for cast iron boilers preferred or MSBSD approved equal

1. Provide a high turndown modulating burner
2. 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.
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 manufacturer’s gas train design specifications.

4. Specify low water cutoff wired in series with burner controls. Follow working pressure of boiler manufacturer. Provide McDonnel Miller test and checks on Low Water Cutoff (LWCO) columns. Acceptable Manufacturer: McDonnel Miller, #63M or MSBSD approved equal.
5. Separately vent each piece of gas fired equipment to main vent, size according to American Gas Association (AGA) code. Shield main vent on roof from weather or wind.
6. Label boilers from left to right, i.e., Boiler #1 on left, Boiler #2 on right when facing the boiler/burner.
7. Burner controls shall include a disconnect switch near burner.
8. Do not mount J-Boxes or panels or disconnects on Boiler skin or within a 4' circumference around boiler.

C. Oil burners should be high turndown modulation burners. Modulation required for 1 million BTU or larger burners.

1. Peripheral Controls should include outdoor reset temperature control, high limit manual reset control and low water safety shutoff control with manual reset. Low fuel oil level alarms on oil fired boilers are required to coincide with burner shut off switches on the day tank.
2. The oil burner shall be tuned to maximum efficiency with no more than 30% excess air, no CO and a maximum of No. 1 smoke as measured on the Bacharach scale.
3. The burners shall incorporate a stainless steel flame retention type combustion head for long life and efficient operation.
4. 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 the primary air-secondary air ration without dismantling the burner.
5. The oil burners shall be mechanical pressure atomizing type equipped with the following:
    a. Two stage oil pumps shall be provided for each burner.
    b. Oil service shutoff valve.
    c. Oil pressure gauges with isolation valve are required to indicate the discharge oil pump pressure and supply pressure to burner nozzle.
    d. Fuel oil filter, General GF2A700A or MSBSD approved equal, and fuel strainer.
    e. Fusible link actuated oil safety shutoff valve for mounting in oil supply line between oil tank and approved isolation ball valve at oil pump.
6. Burner shall be factory assembled with a factory prewired control panel and fire tested at high and low fire at the factory. For burners larger than 3 million BTUs, provide factory prewired 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. Flame Failure

c. Low Water Connection

D. Show and specify gas fired heating units under Mechanical in the contract drawings. Primary heating units shall be low pressure hot water boilers. The design criteria shall be as follows:

1. The design shall be based on multiple boiler heating units that will efficiently run the peak design heating load thru the shoulder months. The capacity calculations shall be based on the following:

a. Entering water temperature (EWT)	160°F
b. Leaving water temperature (LWT)	180°F
c. Delta T	20°

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

3. Hand Off Auto switch on all boilers will provide complete operational control for technician to go from BAS control to local control.

23 82 00 Convection Heating and Cooling Units

Part 1- General

1.01 General Requirements

A. Air Handling Units shall be totally and should be considered for all applications which deliver 6000 CFM or more.

1. Enclosed units shall have provision for noise reduction material to reduce noise transmission.

2. Insulation shall be protected with minimum 20 gauge 1/4 inch perforated metal lining.

3. Units shall have adequately sized, well placed access doors for servicing of fan bearings, fan motor, damper actuators (if used), and shaft.

4. Provisions shall be made for the removal of fan shaft, bearings, and motor, without removal of attached ductwork.

5. Fan unit shall have spring isolation to alleviate sound attenuation.

6. Motor mounting bracket shall be of a screw driven sliding plate design which has a minimum of 6 inch travel and can be secured in position.
7. Provide a mixed air chamber design in fan units 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). Provide windows and light switches on all the man doors into the air handlers.

C. All systems that contain an air handler with a coil that supplies with outside air shall use 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.

1.02 Heating Coils

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

B. 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.)

C. 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.

1.03 Terminal Heat Transfer Units

A. Unit Heaters shall be Trane, Dunham-Bush or MSBSD approved equal

B. Convectors shall be Trane or MSBSD approved equal.

Division 25- Integrated Automation

25 90 00 Integrated Automation Control Sequences

Part 1- General

1.01 Direct Digital Control System Usage

A. The Matanuska-Susitna Borough School District utilizes Direct Digital Control systems for:

1. Monitoring and Control of all major mechanical systems
2. Monitoring and Control of all occupied space mechanical systems
3. Control of site and hockey lighting
4. Monitoring of electrical phase loss, fire and security systems

B. Each school's Direct Digital Control system connects to the MSBSD's wide area network through the school's local area network.

1.02 Direct Digital Control System Access

A. The MSBSD requires that the Direct Digital Control system be capable of being accessed by a password protection through a graphical computer interface Server. Provide an operators terminal located at the school and remote connection by modern connection to a DDC Panel at the school.

1.03 Direct Digital Control System Alarm Monitoring

A. All alarms sent to a control monitoring station.

B. Critical alarms shall be sent to a remote notification system (i.e. text message).

C. The following conditions are defined as critical alarms:

1. Critical pump alarm (i.e. all main circulation pumps)
2. Boiler common supply temp
3. Boiler common header pressure
4. Electrical phase loss
5. Generator run status
6. Other critical alarm items at the direction of the MSBSD

1.04 Electrical Power Phase Loss and Under/Over Voltage Monitoring

A. The Direct Digital Control monitors the quality of the commercial power through the use of a phase/voltage monitor relay.

B. If the relay indicates that the building has lost a phase or that the commercial power is in an under or over voltage situation the Direct Digital Control system will annunciate a critical alarm at all event-monitoring consoles and shut down all three phase motors that are controlled by the Direct Digital Control system.

C. When the electrical condition no longer exists, all electrical motors that had been shut down by the Direct Digital Control system shall be staged on one by one in increments of 10 minute after a time delay of at least 10 minutes.

25 93 00 Integrated Automation Control Sequences for Fire-Suppression Systems

Part 1- General

1.01 Fire Alarm System

A. The Direct Digital Control system will monitor the fire alarm control panel for two signals: fire supervisory and fire trouble. The Direct Digital Control system will use normally closed contacts for monitoring of these conditions.

25 95 00 Integrated Automation Control Sequences for HVAC

Part 1- General

1.01 Outside Air Monitoring

A. The Direct Digital Control system shall monitor the outside air temperature.

1.02 Building Critical Alarming

A. If any room temperature drops below 50°F, the Direct Digital Control system generates a building low temperature alarm.

1.03 HVAC After Hours Override Panel

A. Each school must have an HVAC After Hours Override Panel that will be located in the mechanical/custodial area.

B. The face of the panel will have a map of the school (normally an engraved plastic panel attached to the Panel enclosure) with outlines showing the school mechanical system “zones”.

C. Each zone will be an area served by a specific air handling system.

D. The Panel will have a key switch allowing authorized personnel to activate the zone’s mechanical system during unoccupied times. Any mechanical systems that have been brought on line by the Override Panel will be cancelled at 11:00 PM.

E. The Override Panel will send an alarm to the DDC.

1.04 Primary Air Handling Units

A. Start Stop Control

1. The air-handling unit start/stop function shall be controlled by a start/stop program and by the HVAC After Hours Override Panel.

2. In addition, fans that are the primary source of heat for a facility will be required to operate during unoccupied hours to maintain the unoccupied space temperature set point of 55°F. Occupied space temperature is a setting of 68-72°F.
3. Air handling units that are the primary sources of heating for their respective area shall be turned on during unoccupied hours whenever the Direct Digital Control system senses as space temperature below the unoccupied low limit. When the air-handling unit is operating in this mode it will keep the mixed air dampers in full recirculation and utilize the heating coil to bring the space back to the unoccupied temperature set point.

B. Fan Status

1. Fan status is sensed through the use of a current transformer with a digital output.
2. The current transformer measures the electrical current flow to the fan motor and provides an on/off signal based on the measured current flow (field adjustable).
3. Failure of the fan to prove status within 30 seconds of being commanded to an on state will cause the Direct Digital Control system to generate an alarm on DDC.

C. Preheat Air Control

1. The Direct Digital Control system provides preheat air control by sensing the preheat air temperature and modulating the preheat coil valve to maintain the design set point.
2. If the system utilizes a 2-way control valve then the heating coil valve should be a normally open valve. If it is a 3-way control valve then the heating coil valve will be piped to fail to full flow through the heating coil.
3. A preheat air set point is set by the operator to meet the system design requirements (normally in the range of 35-40°F).
4. Whenever the fan is shut down (whether by the occupancy program or from a safety device) the preheat coil valve is modulated to maintain 50°F as sensed by the preheat air sensor.

D. Mixed Air Control

1. The Direct Digital Control system will modulate the mixed air dampers to maintain the mixed air temperature set point.
2. On system start-up, restrict the speed at which the mixed air dampers can open by ramping the maximum damper position allowed by the control loop from 0% open to 100% open over a fifteen minute window.
3. The mixed air set point shall be reset by comparing the average space temperature in the air handling unit's zone to the space temperature set point as entered by the operator. In addition, the Indoor Air Quality (IAQ) requirements of the building shall override the mixed air temperature control in order to meet the minimum IAQ ventilation standard.

4. If the Direct Digital Control system senses no airflow or if the system is in Unoccupied Mode then the mixed air dampers shall remain in full recirculation.

E. Discharge Air Control

1. The Direct Digital Control system provides discharge air control by modulating the heating coil valve. If the system utilizes a 2-way control valve then the heating coil valve should be a normally open valve. If it is a 3-way control valve then the heating coil valve will be piped to fail to full flow through the heating coil.
2. A discharge air set point is periodically calculated by the Direct Digital Control system by comparing the average room temperature in its zone with the zone set point as entered by the operator. The discharge air set point is allowed to automatically adjust from a low of 45°F to the maximum design temperature.
3. Whenever the fan is shut down (whether by the occupancy program or from a safety device) the heating coil valve is modulated to maintain 50°F in the mixed air plenum

F. Duct Static Pressure Control

1. For VAV systems, the supply air fan variable frequency drive (VFD) is modulated by the DDC System to maintain a duct static pressure set point as determined by the mechanical engineer.
2. When the fan is in the unoccupied cycle or off mode, the variable frequency drive is commanded to the minimum setting, 20%.
3. On system start-up, restrict the speed to which the VFD can be commanded by ramping the maximum speed allowed by the control loop from 0% open to 100% open over a fifteen-minute window.
4. If the fan is commanded on and either a VFD failed condition or a fan failure is sensed by the Direct Digital Control system then the variable frequency drive is commanded to the minimum setting.

G. Low Limit Control

1. An auto reset, double pole, low limit thermostat located on the discharge of the heating coil shall shut down the fan system via a hard wired connection to the motor starter or VFD.
2. After 15 minutes the fan system will restart and resume normal operation. This shutdown/startup procedure will occur a maximum of five times.
3. Upon the sixth low temperature shutdown the system will stop restart attempts and will generate a manually reset maintenance alarm.
4. The count of low temperature conditions will be reset every time the system changes occupied modes.

H. Filter Monitoring

1. The Direct Digital Control system monitors the differential pressure across the filter bank through the use of an air differential pressure analog sensor and generates a maintenance alarm when the pressure drop exceeds its set point.

1.05 Exhaust Fans

A. Building/Classroom Exhaust Fans

1. Building/Classroom Exhaust Fans will be started and stopped in conjunction with their respective air handling units. Provide a start/stop point for each exhaust fan.

2. Fan status is sensed through the use of a current transformer with a digital output. The current transformer measures the electrical current flow to the fan motor and provides an on/off signal based on the measured current flow (field adjustable).

3. Failure of the fan to prove status within 30 seconds of being commanded to an on state will cause the Direct Digital Control system to generate a Maintenance Alarm.

B. Toilet Exhaust Fans

1. Toilet exhaust fans will not normally be controlled by the Direct Digital Control system. They will normally be controlled in conjunction with the local light switch (occupancy sensor). However, in cases where the exhaust fan serves multiple areas it should be controlled in a manner similar to a Building/Classroom exhaust fan.

C. Kitchen Exhaust Fans

1. Kitchen exhaust fans shall be controlled by a switch with disabled time frame located in the kitchen area.

D. Electrical Room Exhaust Fans

1. Electrical Room exhaust fans shall be controlled by a local thermostat that will cycle the exhaust fan and two-position damper.

2. Note that the thermostat and associated control components must be low voltage and conform to NEC Class 2 requirements.

Part 2- Boiler Systems

2.01 General

A. The MSBSD boiler system basis of uses a primary loop and a decoupled secondary loop.

B. The boilers will be controlled through a combination of factory controls and the Direct Digital Control system.

C. The factory controls will provide dry contact outputs boiler enable, to the Direct Digital Control system for the monitoring of boiler status, boiler alarms. The factory controls will also provide for inputs from the Direct Digital Control system for boiler enable and the boiler set point.

D. All direct burner control and safety interlocks will be controlled by the boiler's factory controls.

2.02 Boiler System

A. Primary Loop

1. The primary loop consists of boilers that operate in lead/lag staging. The lead boiler will automatically be switched each month or whenever there is a failure of the current lead boiler.

B. Secondary Loop

1. The secondary loop consists of pairs of pumps that will provide circulation of hot water to the various building mechanical equipment and zones will operate in a lead/lag fashion. The lead pump will automatically switch on a monthly basis or equal timer programming.

C. Boiler Reset Schedule

1. The standard reset schedules in use by the District is a follows:

a. Primary Loop Hot Water Temperature Reset:

1. 190°F HWS at 0°F Outside Air Temperature
2. 140°F HWS at 60°F Outside Air Temperature

2.03 Boiler Monitoring

A. The boilers will be monitored for boiler failure, run status and start/stop. The failure alarm and run status should be a dry contact closure generated by the boiler's factory control panel.

B. Boiler run status is defined as when the boiler factory control circuit or DDC is calling for the burner to operate. Verified run status is when the gas valve opens.

C. The Direct Digital Control system shall generate a critical alarm whenever it detects a failure indication from the boiler's factory control panel or an alarm whenever a boiler is commanded to operate and its associated run status does not prove within a predetermined time delay.

D. Provide thermostats in close proximity to DDC sensor (corresponding).

2.04 Control Sequence for Boilers with Modulating Burners

A. Cycle Up

1. The lead boiler header pump will run continuously; lag boiler header pumps will cycle with their respective boiler.
2. The Direct Digital Control system will compare the primary loop temperature with the primary loop water set point as determined by the reset schedule. If the primary loop temperature is 5°F lower than what is required by the reset schedule then the lead boiler is enabled, and the boiler burner begins modulating.

3. Through the use of an adjustable rate-of-rise time constant the Direct Digital Control system will determine the temperature rate-of-rise of the primary loop water temperature. (The Direct Digital Control system will compare the primary loop temperature at the beginning and the end of the adjustable time constant to determine the system's rate-of-rise).
4. If the Direct Digital Control system determines that the rate-of-rise is not sufficient then the system will modulate the lead boiler to 75% capacity.
5. If the lead boiler is commanded to 75% capacity and the rate-of-rise is still insufficient to achieve set point then the Direct Digital Control system commands the lag boiler header pump on and commands the lag boiler firing rate in a similar manner to achieve set point. Firing rate will be modulated at same rate between running boilers. This sequence continues until the primary loop temperature set point is reached or all boilers are operating at 100% capacity.

B. Cycle Down

1. If the primary loop water temperature is 5°F greater than the primary loop water temperature set point then the sequence is reversed; boiler burners are modulated down to 0% capacity and then the boiler pump and burner are disabled.
2. Note that the lead boiler header pump remains enabled at all times. (Please refer to the Pumps section of this document for specific information on the sequence of operation for the various boiler pumps).

C. Notes

1. In order to ensure the integrity of the boilers this time delay must be coordinated with the boiler manufacturer's designated representative.
2. The Direct Digital Control system must modulate boilers to 0% capacity (low fire) prior to a full shutdown.

2.05 Pumps

A. Boiler Header Pump

1. Each boiler header pump is enabled whenever the respective boiler is enabled or at the discretion of the operator.
2. The lead boiler header pump will run continuously; lag boiler header pumps will cycle with their respective boiler.
3. The boiler header pump will continue to operate for 10 minutes after its respective boiler has been disabled.
4. If the boiler header pump fails to prove flow through its current transformer then its associated boiler will be disabled, and a critical boiler header pump alarm will be generated.
5. On a return to normal status, all associated alarms and lockouts shall be released.

6. The pump runs whenever the boiler internal temperature drops below 120°F. (Note that this pump is not controlled by the Direct Digital Control system).

B. Boiler Blend Pump

1. Each boiler blend pump is enabled and disabled whenever the respective boiler burner is enabled or disabled or at the discretion of the operator.
2. If the blend pump fails to prove flow a maintenance boiler blend pump alarm will be generated.

C. Secondary Loop Heating Pumps

1. The primary heating pumps will be a pair or multiple pairs of pumps that will operate in a lead/lag fashion. When operating in auto mode, the pumps shall alternate on a monthly basis.
2. The Direct Digital Control system will provide a start/stop control through the motor starter. The pump electrical disconnects should also be provided with hand-off-auto switches for manual override.
3. Pump status is sensed through the use of a current transformer with a digital output. The current transformer measures the electrical current flow to the pump motor and provides an on/off signal based on the measured current flow (field adjustable).
4. Upon failure of the lead pump, the Direct Digital Control system will shut down the pump, start the lag pump and signal a maintenance alarm to the District's alarm monitoring computer consoles. Upon failure of the lag pump the DDC system shall signal a critical alarm.

D. Domestic Recirculation Hot Water Pump

1. The pump is commanded on and off through the Direct Digital Control system. Provide a start/stop schedule for hot water system.
2. On when Security System is dis-armed.
3. Off when Security System is armed.

Part 3- Space Temperature Control

3.01 Variable Air Volume Terminal Units

A. General

1. Variable Air Volume Terminal Units will be controlled by the Direct Digital Control system. A Direct Digital Control room thermostat with LCD temperature indication provides temperature, set point, and unoccupied override inputs to the VAV terminal unit controller.
2. Units with reheat shall have a discharge sensor mounted downstream of the reheat coil and connected to the aux terminals of the TEC room controller.

B. Occupied Mode

1. During Occupied Mode (whether by schedule, or by operation of the unoccupied override input) the terminal unit control damper will modulate between Minimum Heating CFM and Maximum Heating CFM to maintain the zone day temperature set point plus or minus 2°F. If the terminal unit has a reheat coil then the control valve will modulate in parallel with the terminal unit control damper as the damper modulates between a Minimum Heating and Maximum Heating CFM.
2. The supply air temperature of the terminal unit should be limited to a maximum of 20°F above room set point temperature. In rooms with auxiliary baseboard heating modulate the baseboard control valve in parallel with the reheat coil control valve.

C. Unoccupied Mode

1. During Unoccupied Mode the operation is identical to Occupied Mode, except that the night temperature set point is set back to 55°F and the system need only control to within plus or minus 2°F. In order to avoid unnecessary operation of the air handling unit modulate the baseboard control valve to full open position before opening the reheat coil control valve.
2. If the space temperature falls 3°F below the night temperature set point open the VAV terminal unit damper to 100% open, start the air-handling unit in non-IAQ mode (or start the local fan in spaces with fan powered boxes) and modulate the baseboard valve in parallel with the reheat coil control valve.
3. Once the space temperature climbs to 3°F above the night temperature set point close the VAV terminal unit damper and reheat coil valve, stop the air-handling unit, and return the system to normal Unoccupied Mode operation. Note that spaces that utilize fan powered boxes will not bring on the air handling unit.
4. Activation of the override pushbutton located on the thermostat will return the space to occupied mode set points and control for a period of two hours. At the end of the override time the space will return to unoccupied mode control sequence.

3.02 Constant Volume Terminal Units with Reheat

A. General

1. Constant Volume Terminal Units will be controlled by the Direct Digital Control system. A Direct Digital Control room thermostat with LCD temperature indication provides temperature, set point, and unoccupied override inputs to the terminal unit controller.
2. The Units shall have a discharge sensor mounted downstream of the reheat cool and connected to the aux terminals of the TEC room controller.

B. Occupied Mode

1. During Occupied Mode (whether by schedule of by operation of the unoccupied override input) the terminal unit reheat coil control valve will modulate to maintain the zone day temperature set point plus or minus 2°F.

2. In rooms with auxiliary baseboard heating modulate the baseboard control valve in parallel with the reheat coil control valve.

C. Unoccupied Mode

1. During Unoccupied Mode the operation is identical to Occupied Mode, except that the night temperature set point is set back to 55°F and the system need only control to within plus or minus 2°F. In order to avoid unnecessary operation of the air handling unit modulate the baseboard control valve to full open position before opening the reheat coil control valve.
2. If the space temperature falls 3°F below the night temperature set point start the air-handling unit and provide heating to the space by modulating the baseboard valve in parallel with the reheat coil control valve.
3. Once the space temperature climbs to 3°F above the night temperature set point close the reheat coil valve, stop the air-handling unit, and return the system to normal Unoccupied Mode operation.

Part 4- Classroom Unit Ventilators

4.01 Classroom Unit Ventilator Units

A. General

1. Classroom Unit Ventilators will be controlled by the Direct Digital Control system. A Direct Digital Control room thermostat with LCD temperature indication provides temperature, set point, and unoccupied override inputs to the unit vent controller.
2. The unit ventilator will follow an ASHRAE Cycle 2 sequence of operation. A discharge sensor mounted downstream of the reheat cool and connected to the aux terminals of the TEC room controller.

B. Occupied Mode

1. During Occupied Mode the unit ventilator fan will start. The Direct Digital Controller will maintain the room temperature by resetting the discharge air temperature set point.
2. The heating coil valve and mixed air dampers will modulate to maintain the zone day temperature set point plus or minus 2°F.
3. A minimum percentage of outdoor air is provided to meet ASHRAE minimum ventilation requirements. Bypass dampers are not acceptable as part of the sequence.

C. Unoccupied Mode

1. During Unoccupied Mode the operation is identical to Occupied Mode, except that the night temperature set point is set back to 55°F and the system need only control to within plus or minus 2°F.

2. If the space temperature falls 3°F below the night temperature set point start the unit ventilator and provide heating to the space by modulating the heating coil control valve-mixed air dampers are to remain in full recirculation mode.
3. Once the space temperature climbs to 3°F above the night temperature set point the heating coil valve closes, the unit ventilator fan stops, and the system returns to normal Unoccupied Mode operation.

D. Safeties

1. A factory installed low temperature detector in the discharge air stream de-energizes the unit fan and generates a maintenance alarm.
2. Mixed air dampers and heating coil valves shall spring return to the fail safe position.

E. Preheat Air Control

1. The Direct Digital Control system provides preheat air control by sensing the preheat air temperature at the intake of one Classroom Unit Ventilator and calculating a control signal output. This control signal output is then sent to all of the Classroom Unit Ventilator's preheat coil valves. This allows the Direct Digital Control system to efficiently control all preheat coil valves while requiring only one preheat temperature input.
2. If the system utilizes a 2-way control valve then the heating coil valve should be a normally open valve. If it is a 3-way control valve then the heating coil valve will be piped to fail to full flow through the heating coil.
3. Whenever the Classroom Unit Ventilators is shut down (whether by the occupancy program or from a safety device) the preheat coil valve is modulated to maintain 55°F as sensed by the single preheat air sensor.

4.02 Low Space Temperature Critical Alarm Monitoring

A. The Direct Digital Control system will evaluate all of its room sensors and determine the lowest space temperature in the facility.
B. If the lowest temperature is below 50°F whenever the outside air temperature is below 40°F the Direct Digital Control system will generate a critical alarm.

4.03 High Space Temperature Maintenance Alarm Monitoring

A. The Direct Digital Control system will generate a maintenance alarm if any room temperature rises above 90°F.

25 96 00 Integrated Automation Control Sequences for Electrical Systems

Part 1- Emergency Generator Systems

1.01 Emergency Generator Monitoring

A. The Direct Digital Control system monitors the emergency generator for run status, pre-alarm, and generator failure. On detection of a run condition or a failure the Direct Digital Control system will generate a critical alarm. DDC should recognize weekly, scheduled Genset operation to exercise unit.

1.02 Emergency Generator Ventilation

A. On detection of a generator run condition the control system modulates the intake, exhaust, and recirculation dampers to maintain the generator room temperature set point. When the generator is off, the generator system closes the intake and exhaust dampers and opens the recirculation damper. Provide emergency power for day tank supplying generator.

B. This control sequence will be performed by the generator system.

Part 2- Lighting

2.01 General Description

A. The Direct Digital Control system will control parking, exterior building lighting, and hockey rink lighting.

B. The Direct Digital Control system will have a photocell input point that will be active when there is adequate daylight to no longer require the use of site or hockey lighting.

C. The Direct Digital Control system will also have an input point that will allow for remote activation of the lighting by District Maintenance personnel through the use of a handheld radio transmitter remote activation unit. The transmitter shall allow the exterior lights to be switched on during hours that the lights are normally scheduled off.

2.02 Exterior Site Lighting

A. The lighting is staged on with individual zone schedules as per MSBSD standard.

B. The lighting is turned on whenever the security or fire alarm panels are in alarm condition and the photocell is in the night mode. The lighting will remain on until the alarm condition is cleared.

C. The lighting shall also be brought on for a period of 2 hours if activated by the radio transmitter.

D. In the event that an operator overrides the control program the Direct Digital Control System shall release any operator overrides in coordination with the photocell changing state.

E. Hockey Rink Lighting

1. The Hockey lighting is to be enabled during scheduled times for a demand switch. In the event that an operator overrides the control program the Direct Digital Control System shall release any operator overrides in coordination with the photocell changing state.

2.03 Interior Lighting

A. General

1. The interior lighting controlled by the Direct Digital Control system should use a mechanically held (as opposed to electrically held) contactor. This will allow the Direct Digital Control system to sweep on or off interior lighting as necessary while still allowing the occupants to control the lighting with local momentary switches.

B. Night Lighting for Elementary and Secondary Schools

1. The Direct Digital Control system monitors the security system for alarm/normal and armed/disarmed status and uses this information to control the lighting. When the Direct Digital Control system receives status information indicating that either the building is open (i.e. the security system is disarmed) or that the security system is in alarm the Direct Digital Control will immediately send an on command to the lighting contactor.

2. When the Direct Digital Control system receives status information indicating that the building is closed (i.e. the security system is armed) the Direct Digital Control will wait 5 minutes and then send an off command to the lighting contactor.

C. Corridor Lighting for Elementary and Secondary Schools

1. The Direct Digital Control system monitors the security system for alarm/normal and armed/disarmed status and uses this information to control the lighting. When the Direct Digital Control system receives status information indicating that either the building is open (i.e. the security system is disarmed) or that the security system is in alarm the District Digital Control will immediately send an on command to the lighting contactor.

2. When the Direct Digital Control system receives status information indicating that the building is closed (i.e. the security system is armed) the Direct Digital Control will wait 5 minutes and then send an off command to the lighting contactor.

D. Gym Lighting for Elementary and Secondary Schools

1. Provide local motion sensors in the gymnasium which will automatically turn on the lighting when they detect activity in the area. Provide an override switch (es) to turn lighting off only, or lighting off in stages if so provided.

2.04 Lighting Controls

A. General Considerations

1. Occupancy sensors will control all interior areas, DDC allowed only in exterior settings

2. Mount occupancy sensors at least 6 to 8 ft away from HVAC ducts.

3. Ultrasonic sensors should be mounted on vibration free, stable surfaces and should not be used in areas of heavy air flow, moving objects, or where the ceiling height is greater than 14 ft.

4. If there is a concern that lighting could be turned off automatically or manually when people are still in a space, put in night lighting for safe egress.
5. Use products that are durable and can resist abuse, such as stainless steel wall plates.

B. Classrooms

1. Dual technology occupancy sensors should be used for classrooms with a 15 min delay.
2. Classrooms with possible hanging artwork that can move due to air flow, should utilize passive infrared sensors.
3. Mount occupancy sensors so there is no detection outside the door. They should be mounted close to the teacher's desk, above the main level of activity, and below fixture mounting heights. They should not be placed where they could be covered by artwork, shelves or other furniture.
4. Always include switches that provide manual override control of the lighting with automatic reset at start of each day.
5. Consider daylight responsive, continuous dimming control.
6. Each classroom will have three levels of control.
    a. Manual off for teaching purposes
    b. Down lighting or dimmable for low levels
    c. Up lighting for normal teaching conditions

C. Public Spaces/Common Areas

1. Public spaces, such as hallways and restrooms, are best suited for automatic on/off control of lighting. If manual control is needed, use key operated switches or install switches in secured areas.
2. Consider daylight responsive, stepped dimming control.

D. Gymnasiums/Multipurpose Rooms

1. Provide occupancy sensors and manual override.
2. Use bi-level control with occupancy sensors and time based control for shut off after hours.

E. Restrooms

1. Use ultrasonic sensors for spaces such as restrooms with stalls even when there is no direct line of site of the occupant from the sensor.

F. Exterior

1. Use DDC lighting control and photocell, control exterior lighting to turn on before school and off at scheduled time.

25 98 00 Integrated Automation Control Sequences for Electronic Safety and Security Systems

Part 1- General

A. Security System

1. The Direct Digital Control system will monitor the security system for two signals; security alarm and armed/disarmed status. If the Direct Digital Control system detects a security alarm a critical alarm will be generated. The Direct Digital Control system will use normally closed contacts for monitoring of these conditions.

Division 26- Electrical

26 00 00 Electrical

Part 1- General

1.01 General Comments

A. All work performed under this section shall be in accordance with the most current National Electric Code (NEC), Authority Having Jurisdiction (AHJ), with the drawings and MSBSD Standard Specifications and subject to the terms and conditions of the Contract.

B. 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 not forget the telephone company, they need to be informed of entrance locations, number of lines, punch blocks panels, etc. Consider that local utilities are slow to respond and plan accordingly (long lead time for service).

C. Cross coordinate with all other Architectural Divisions.

D. Consider alternative energy means to minimize operating costs on major projects (greater than 70,000 SF). This specifically includes fuel cells or other new and emerging technology where they can be shown to offer lifecycle cost benefits.

E. The fundamental requirement is that clear, concise and correct drawings and specifications are provided so that all bidders are able to prepare estimates on exactly the same work and construction may proceed with no misunderstandings on the work to be done.

F. All work shall be inspected before covering (i.e. underground, walls) by state electrical inspector and MSBSD.

1.02 Codes

A. Comply with all current laws, rules and regulations of the State of Alaska Administrative Code (hereinafter referred to as AAC) for all MSBSD designs.

1.03 Designs and Project Procedures

A. The Architect and Engineer shall meet with the MSBSD at the completion of the schematic design phase to review issues which include: lighting fixture types, equipment selecting panel locations proposed, alarm systems and lighting controls.

B. The Architect and Engineer shall meet with the MSBSD upon completion of the design development drawings. Items and discussions to include:

1. Load calculations to substantiate service and generator sizing, including spare capacity as directed by MSBSD in excess of 25%.
2. Lighting layout, including fixture types and designed illumination levels.
3. Planned electrical distribution system design.

4. Special system schematics.

1.04 Specifications and Drawings

A. Redline changes on construction drawings need to be kept up to date and available for review. Make each division of the specifications complete in itself. Avoid duplication and conflict between the specifications and the plans.

B. 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.

C. Make schematics and diagrammatic details for each project large enough to be easily read. Scale boiler room, kitchen and mechanical / electrical room plans and elevations at 1/4" minimum. Use 1/2" or larger if required to clearly show details of design.

D. On each set of plans provide an adequate identifying legend of all symbols used. Identify and define all abbreviations used on the drawings.

E. 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.

F. Provide separate drawings for lighting, power, network infrastructure and specialty systems.

G. 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.

H. 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.

I. Show all electrical service and meter equipment and locations. Do not imply responsibility of the contractor for elements of engineering design in specification paragraphs that require compliance with rules, regulations and codes.

J. 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 manufacturers' products, the specifications should state the installation requirements explicitly and in detail.

K. 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 Electrical and Mechanical drawings showing in which division(s) each item are specified and which trade installs the item. Include, as a minimum, the controls schematic diagrams, sequences of operation, specifications and BAS points list. Provide printed and electronic (PDF) copies of all PPCL Control Language.

L. 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.

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

N. For all new construction provide at least two (2) inch empty conduits to future locations for portables, ball fields, etc. All network conduits must meet current standards for data and voice, including, but not limited to distance requirements to nearest MDF or IDF. Empty conduit should be drilled and prepared for use, with pull strings, labeled at panel and terminated with a J-box.

1.05 As-Builts (Record Drawings)

A. Accurate “As-Builts” are essential. This must be spelled out clearly in the contract documents and diligently pursued during construction by MSBSD, Architect, and Contractor. Maintain redlines on site.

B. MSBSD requires three (3) hard copy sets of “As-Builts” turned in for record purposes. Two of these shall be submitted on Architectural D size (24x36 inches) paper and one half size copy. A copy of all “As-Built” Record Drawings shall be provided in digital format.

C. “As-Built” Record Drawings shall include controls, fire alarms, clock intercoms, sprinkler, BAS system and all other shop drawings.

D. Electrical “As-Builts” must show actual circuit routing by complete point to point lines.

1.06 Access

A. Access for operation, maintenance, repair or replacement of any equipment or item is very important. Mechanical access will be off common areas. Access to operate, maintain, repair or replace such equipment or item without disassembly or damage to the surrounding structure is required.

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 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. Consider the use of lifting cranes for heavy equipment and the need for larger access doors to upper areas with larger equipment.

C. Pay particular attention to access and clearance for all main, distribution, or control, panel boards, equipment racks and enclosures. Refer to all applicable codes for working clearances.

D. Provide power and lighting to required maintenance access areas

1.07 Building Utility Service Locations

A. Information regarding the location, size and elevations of existing utilities and service points shall be confirmed in the field by the Electrical Engineer if necessary.

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

C. Coordinate with local utilities to fully satisfy their specific requirements.

1.09 Existing Equipment

A. Reference in the specifications and shop drawings any existing mechanical or electrical equipment shown on the plans, or specified as being furnished by the MSBSD.

Part 2- Basic Methods and Materials

2.01 General

A. Provide minimum 25% spare conduits, identified as spare and terminated for electric power, clock and speaker system, and fire alarm system, etc. Terminate where future additions or improvements might take place. Permanently label both ends of empty conduits as to origin and termination.

B. Conduit runs exceeding 75 feet in length between panels/j-boxes/outlet boxes shall be a minimum 1" diameter.

C. Provide pull lines in empty conduits. Wire in conduit not to exceed NEC tables of conduit capacity.

D. All ground mounted flood lighting shall be elevated at least 36 inches above ground level on concrete pedestals. Restrict maximum voltage to 120V. Circuit to be supplied from a 15 amp GFCI breaker. Notwithstanding this specification; ground mounted architectural or decorative lighting allowed only by MSBSD.

E. Provide minimum 25% additional panel space.

F. 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.

G. Group classroom outlet circuits room-by-room. In classrooms provide duplex outlets on walls on 6 foot centers, minimum three walls.

H. Administrative offices, teachers work rooms, etc. shall have double duplex outlets on 4 foot centers, 3 walls minimum.

I. Computer classrooms shall be equipped with perimeter Wire-mold series 4000 two channel surface raceway, minimum 4 walls, with two adjacent duplex receptacles on 48 inch centers in the wire mold.

J. Twenty Amp GFCI outlets required within 6 feet of any sink or plumbing fixture.

K. All exterior buried conduits shall be sloped for drainage away from building and bedded in sand. Conduits extending beyond the building from within shall be GRC for the first 10ft.

L. All horns, bells, lights etc. mounted exterior to the building shall be at ten feet height minimum and inaccessible to tampering or vandalism.

M. All heat tapes shall be on Equipment Protection GFCI breakers connected to BAS and monitored by self-analyzing sensors. Disconnect switches for heat trace (if needed) shall be located in an electrical/mechanical room clearly marked on the “as-built” prints. All heat trace switches should be labeled.

N. All electrical devices and their associates poles, posts, brackets and boxes shall be connected to a properly sized grounding conductor per NEC which shall be continuous to the feeding panel, then to the building ground rod system.

O. Flexible metal or LiquidTite conduit may be used only in lengths not exceeding 6’ in length. Flexible conduit shall not penetrate walls.

P. Use of armored or metal clad (type MC) cable is not permitted, as it does not allow for future pulling of different conductors.

Q. Provide conduit or surface raceway for all exposed wiring.

R. Third party inspection of all systems at completion of projects will be required.

S. No floor mounted receptacles permitted.

T. Duplex receptacles shall be 20 amp rated 3.wire, self-grounding. Installed with the ground port on top. Exceptions allowed only by MSBSD.

U. Control Voltage: Verify with BAS system requirements

V. Disconnects shall be located at control device in compliance with all applicable codes.

W. Transformers must be pad mounted.

X. Surface raceway will be discouraged wherever possible.

Y. All j-boxes shall be labeled with panel and circuit number.

Part 3- Products

3.01 General Products

A. Provide totally enclosed, fan cooled commercial grade, 3 phase motors for all motors 1 HP or larger.

B. Square D motor starters with thermal overload protection, no substitutions. Use separate relays for over/under and phase loss/reversal protection. Over/under voltage

and surge suppression is required on all boiler circuits. Motor starters to be magnetically held. Mechanically held contactors unacceptable.

C. Consider the use of solid state contactors to reduce equipment with moving parts.

D. Provide submittals for all equipment and products to be reviewed and signed off by MSBSD before ordering.

26 01 00 Operation and Maintenance of Electrical Systems

Part 1- General

1.01 Special Systems

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.

2. Headbolt Outlets where specifically approved by the MSBSD. Headbolt controls shall be a function of the BAS system.

26 05 00 Common Work Results for Electrical

Part 1- General

1.01 Common Work Results

A. All wire and cable sizes noted on the drawings are for copper conductors and copper conductors shall be used throughout the entire installation. Exceptions per MSBSD.

B. Any conductors that extend below grade, interior and exterior shall be suitable for wet locations (Type XHHW).

C. The use of THHN below grade is not acceptable.

1.02 General Electrical Distribution Systems

A. Provide a minimum of not less than 4 feet minimum working clearance of poured concrete in front of the switchgear.

B. Switchboards and electrical equipment shall be located in dedicated electrical rooms only with panic hardware towards the egress. Switchgear shall not be located in boiler rooms. No overhead sprinkler or other piping inside the electrical room.

C. All panelboards and distribution panels shall have a neutral and ground bus.

26 06 53 Identification for Electrical Systems

Part 1- General

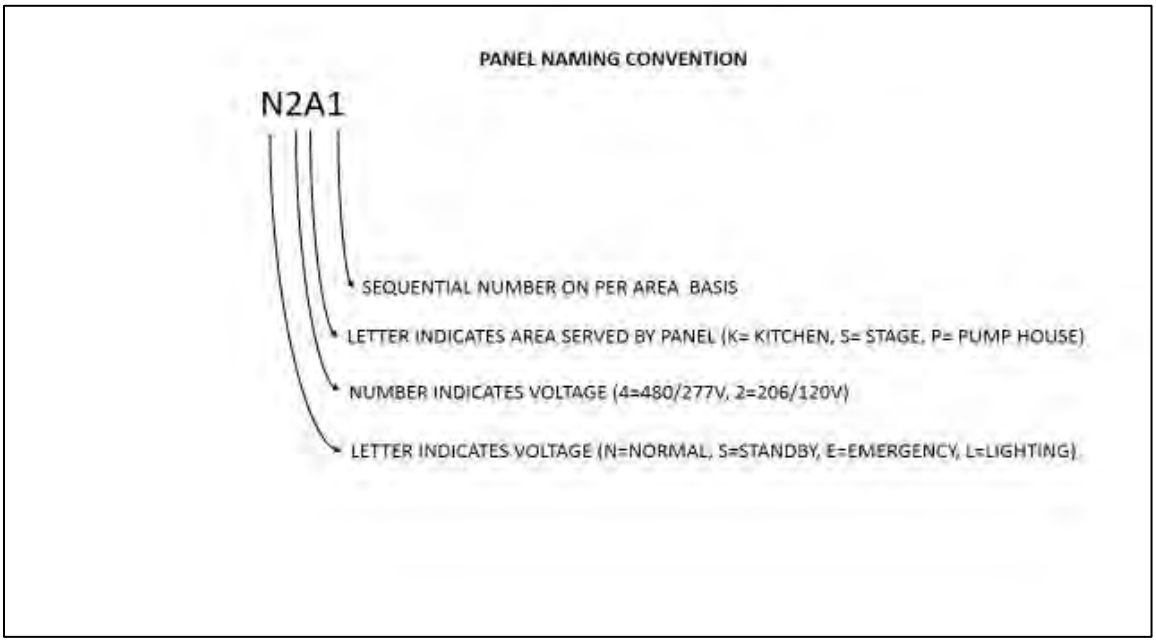
1.01 Summary

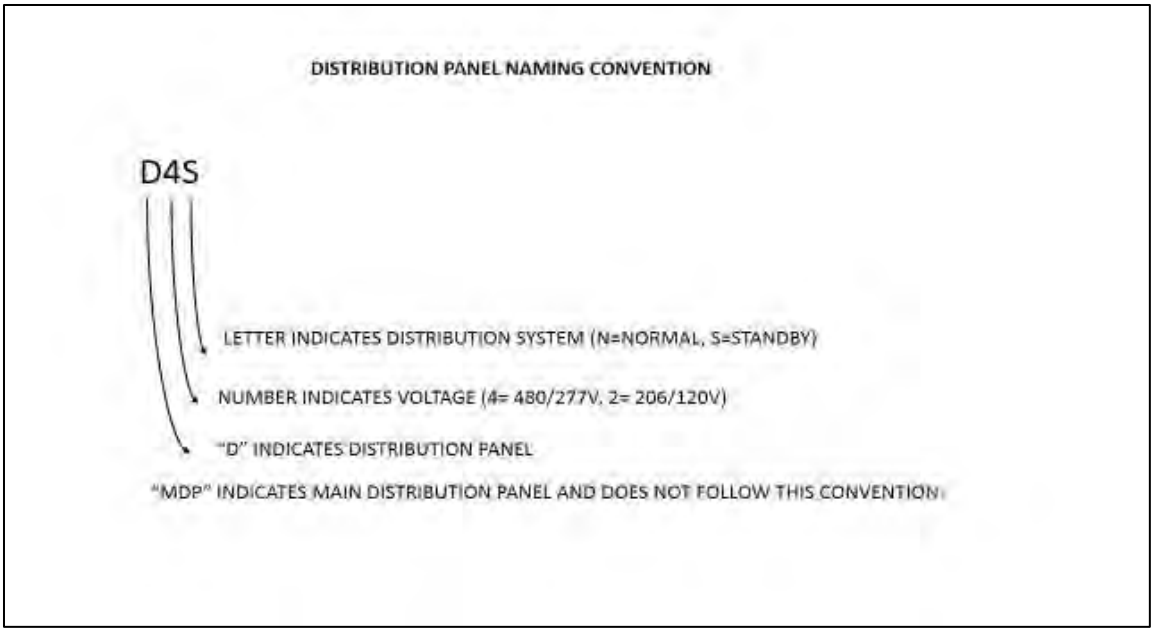
A. All sub distribution panel boards or sub panel boards, motor control centers and disconnects shall be labeled as to source of supply and location by room number. All labels to be mechanically fastened, permanent laminated plastic placards with engraved lettering 1/4" in height of contrasting color. Background of labels shall be colored as to system Black- Normal, Yellow- Standby and Red for Emergency/Egress.

B. Main feeder conduits to each panelboard and distribution panel shall be labeled. Labeling shall be legible and permanent.

C. All 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 documents. Coordinate with the MSBSD prior to construction of signs. Branch panel boards shall have a label denoting source of power supply by room number and disconnect number.

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 appropriately colored background. Mechanically fasten labels to panels. Panels shall be located in nonpublic areas. See following Numbering Sequence.





E. All conductors passing through gutters 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:

1. Red= Fire alarm
2. Yellow= standby power, emergency power
3. Blue= PA and clocks
4. Orange= Security

Acceptable coloring methods are paint bands on 4 foot centers or solid coloring.

26 26 00 Power Distribution Units

Part 1- General

1.01 Description

A. For facilities larger than 50,000 square feet, provide 277/480V, 3 pole, 4W underground service. Underground service shall be buried in rigid conduit from property line to distribution point.

B. For facilities less than 50,000 square feet, provide 120/280V, 3 pole, 4W underground service. Underground service shall be buried in rigid conduit from property line to distribution point.

C. Power monitoring equipment to be installed on each distribution system and interface with BAS.

D. Provide electrical receptacles in corridors at least every 30'. Each receptacle shall be on a dedicated 20 amp circuit.

E. Provide four (4) 30 amp L5-30 outlets on back wall behind each rack in each MDF / IDF room. Each should be clearly labeled as “Standby power” or otherwise.

F. All mechanical systems shall be supplied from mechanical panel boards.

G. Do not locate panels in boiler rooms.

H. Kitchen panel boards shall supply kitchen equipment only.

I. Provide readily accessible shunt-trip button to shut off all equipment in CTE rooms.

J. Provide 60 Amp RV pedestal in location approved by MSBSD.

26 32 00 Packaged Generator Assemblies

Part 1- General

1.01 General Criteria

A. Standby generator to be designed installed and tested in compliance with NFPA 110. Standby generators to provide power to continue to heat, light, and provide water to the building for continued operation during utility power outages. This includes enough lighting in classrooms to continue to hold class productivity.

B. The generator will be appropriately sized for school demand and is to have both emergency and standby circuits. Emergency applications of generator and dedicated circuits will conform to all applicable codes.

C. The standby applications of the generator shall be based on the Emergency Shelter Part 4, 26 32 13 Part 4.

D. Provide self-contained emergency light in mechanical generator and electrical rooms. Make all self-contained Emergency Lights surface mount.

26 32 13 Engine Generators

Part 1- General

1.01 Standby Generators

A. Engine: Onan/Cummins Power Generation is required. Bid specifications must be proprietary in that there will be no substitutions, only listed manufacturers will be accepted.

B. Power plant: Onan is required.

C. Provide appropriately sized gel cell batteries. Do not use wet cell batteries.

D. Standard cooling system (radiator type) freeze protected -60°F.

E. Residential type silencer with a minimum overall attenuation level of 40 dB (A).

F. All flexible fuel lines to be made of stainless steel- NOT rubber.

G. Full set of O&M and repair manuals.

Part 2- Products

2.01 Description of Systems

A. Provide a surface mounted 20-light LED type remote alarm annunciator panel with brushed stainless steel finish and alarm horn. The remote annunciator shall provide all the audible and visual alarms called for by NFPA Standard 110 for level 2 systems for the local generator control panel. Annunciator shall be labeled with the specified functions. Alarm silence and lamp test switches shall be provided. Alarm horn (when switched on) shall sound for the first fault, and all subsequent faults, regardless of whether first fault has been cleared, in compliance with NFPA 110 3-5.6.2. The interconnecting wiring between the annunciator and other system components shall be displayed on the annunciator panel. Provide alarm horn, and indicators and alarms as follows: LED lamps shall be replaceable, and indicating lamp color shall be provided to allow future addition of other alarm and status functions to the annunciator. Alarm horn shall be switchable for all annunciation points.

Condition	Lamp Color	Audible Alarm
Genset Running	Green	No
Not in Auto	Red (Flashing)	Yes
High Battery Voltage	Red	Yes
Low Battery Voltage	Red	Yes
Charger AC Failure	Red	Yes
Fail to Start	Red	Yes
Low Engine Temperature	Amber	Yes
Pre-High Engine Temperature	Amber	Yes
High Engine Temperature	Red	Yes
Pre-Low Oil Pressure	Amber	Yes
Low Oil Pressure	Red	Yes
Overspeed	Red	Yes
Overcrank	Red	Yes
Emergency Stop	Red	Yes
Low Coolant Level	Amber	Yes
Low Fuel Level	Amber	Yes
Network OK	Green	Yes
4 (Spares)	Configurable	Configurable

Low battery voltage lamp shall also be lighted for low cranking voltage or weak battery alarm.

2.02 Typical Construction

A. Unit shall be complete packaged engine generator system in an arctic walk-in enclosure with belly tank.

B. Each unit will have a steel rail base mounted on Mason springs with snubbers. Each engine generator along with its base, springs, and snubbers shall be mounted on a housekeeping pad. Mounting arrangement shall permit removing oil pan without moving generation unit.

2.03 Generator

A. Generator Set Characteristics

1. Rating shall be as specified by MSBSD

2. The specified KW shall be for continuous electrical service during any length of interruption of the normal utility source.

B. Generator

1. The generator shall be a three-phase, 60 Hertz, single bearing, synchronous type with brushless exciter and be built to NEMA Standards.

2. A generator mounted volts-per-Hertz type regulator shall be provided to match the characteristics of the generator engine.

C. Generator Main Circuit Breaker

1. A generator mounted molded case main three pole circuit breaker with characteristics as recommended by generator manufacturer for proper generator protection shall be installed as a load interrupting and overcurrent protection device. It shall operate both manually for normal switching function and automatically during overload and short circuit conditions.

2.04 Engine

A. Liquid cooled, in line or V-type four-cycle compression ignition diesel and meet specifications when operating on low sulfur diesel fuel. Equip the engine with fuel filters, lube oil filters, intake air filters; lube oil coolers, jacket water heater, fuel transfer pump, fuel priming pump, coolant pump and glycol/water coolant in a ration designed for the lowest anticipated ambient temperature.

B. Provide Safety shut-offs for high coolant temperature, low oil pressure, over-speed, engine over-crank and high lube oil temperature.

C. The engine may be turbo-charged to meet horsepower requirements at the specified power rating.

2.05 Cooling Equipment

A. Provide an engine-mounted radiator with blower type fan sized to maintain safe operation at 100°F maximum ambient temperature.

B. Each engine cooling system shall be filled with a solution of ethylene glycol and water. Anti-freeze shall be rated to -60°F.

2.06 Fuel System

A. Provide an engine-mounted fuel filter, fuel pressure gauge, and engine fuel priming pump.

B. Provide flexible stainless steel fuel connections at engine and at tank.

C. Provide high level warning and alarm plus low level warning and alarm reporting to BAS from each tank.

2.07 Exhaust Systems

A. Provide properly sized, critical area exhaust silencer including flexible exhaust fitting for remote mounting.

B. Mount silencer(s) so its weight is not supported by the engine. Exhaust pipe sizes shall be sufficient to maintain exhaust back pressure well within maximum limitations specified by the engine manufacturer.

2.08 Automatic Starting Systems

A. Unit shall incorporate a starting system with these characteristics.

1. Provide a 24 volt DC electric starting system with positive engagement drive.

B. Controls

1. Provide a fully automatic generator set start-stop controls in the generator control. Controls shall provide shutdown for low oil pressure, high coolant temperature, overspeed, overcrank, high lube oil temperature and contain auxiliary contacts for activating accessory items. Controls shall include a 45 second single cranking cycle limit with alarm and lockout and manual rest.

2. Provide a thermostatically controlled unit mounted thermal circulation type coolant heater to maintain engine jacket coolant to 90°F in an ambient temperature of 50°F, single phase, 60 Hertz, 120 volts. Provide a low temperature alarm from each unit reporting to the BAS anytime coolant temperature falls below 80°F.

3. Provide a 24 volt valve regulated lead acid gel cell type storage battery of the heavy-duty diesel starting type, of sufficient capacity to provide one and one half minutes total cranking time without recharging and rated no less than 380 cold cranking amperes. Provide battery racks, necessary cables and clamps.

a. Wet cell batteries are unacceptable.

4. Provide a current limiting battery charger for unit to automatically recharge batteries. Include overload protection, silicon diode full-wave rectifiers, voltage surge

suppressors, DC ammeter, a fused AC input. AC input voltage shall be the same as generator output voltage, Exception per MSBSD.

2.09 Walk-In Enclosure

A. Generator shall be in an insulated walk in enclosure with day tank, insulated paneling, electric unit heater, structural supports, lighting, generator distribution panel, and associated accessories.

B. Provide code required working clearances as a minimum around generator and in front on generator distribution panel.

Part 3- Execution

3.01 Wiring and Connections

A. Provide all wiring in conduit.

B. Provide dry contacts to open outside air louver and turn on exhaust/air circulation fans, etc. when engine starts. The control shall be a function of this equipment or the equipment specified.

C. Connect neutral point of generator and generator frame to service ground. Provide connection at units as recommended by generator manufacturer.

3.02 On Site Testing

A. Test and adjust units with automatic switchgear on site.

B. Provide load banks if required, but perform a full rated load test for 8 continuous hours minimum. Should shutdown occur for any reason, correct reason for shutdown and re-start test. Continue testing until the 8 continuous running hours are achieved within normal operating parameters without shutdown.

C. Submit certified data of tests.

D. Test alarm and shut down circuits by simulating each condition for each unit which would result in shutdown and alarm. Include description of simulation technique in certification.

E. Submit recorded performance data for evaluation to MSBSD for approval before request review for substantial completion.

Part 4- Emergency Shelters

A. Schools shall be equipped with sufficient backup power to act as a shelter where necessary

B. The fire alarm and security panel shall be circuited to the emergency power panel.

C. Telephone equipment shall be circuited to the emergency power panel.

D. Provide fuel storage for at least 4 days (96 hours) of power plant operation.

E. The following areas shall be equipped to run on back-up power:

1. All mechanical (Boilers etc.)

2. Telecommunications
3. Water Systems
4. Water Heaters
5. Interior Lights
    a. Gym- 100%
    b. Halls- 25%
    c. Classrooms- 25%
    d. Locker Rooms and Training Rooms- 100%
    e. Bathrooms- 100%
    f. Showers- 100%
    g. Kitchen- 100%
    h. Admin- 25%
    i. Exterior Lights-50%
6. Elevator
7. Kitchen
    a. Refrigerator
    b. Freezer
    c. Ice Machine
    d. Oven/Range
8. Nurse's Area

F. Outlets
1. One (1) outlet in every room shall be on backup power
2. Five (5) outlets in the gym shall be on backup power
3. Locker Rooms must have four (4) washer and dryer outlets and ice machine outlet on back-up power
4. All Admin

26 36 00 Transfer Switches

Part 1- General

1.01 General Requirements

A. Transfer Switch shall be Onan/Cummins Power Generation. Provide 2 transfer switches, 1 for legally required emergency egress lighting and 1 for standby power.

Program transition to allow for motor load decay. Transfer switch shall have the following features:

1. Electronic digital exercise clock shall be programmable
2. Voltage sensor for all 3 phases, amperage, Hertz, etc.

26 50 00 Lighting

Part 1- General

1.01 Description

A. Coordinate lighting system design with MSBSD.

B. Provide simple but adequate light in crawl spaces, pipe chases, and utilidors. In these areas, an illuminated switch is required when lights are on. Provide guards on all lighting of this category. Lighting will be LED.

C. Require vandal protection for all exterior lighting less than 10 feet. Use LED fixtures for exterior lighting controlled by photo cell / BAS system. Flush mounted light fixtures are preferred. The photo eye for exterior lighting control shall be a digital input to BAS.

D. The lighting systems shall be controlled by motion detectors in corridors and similar public spaces classrooms, offices, etc.

E. Provide controls to provide energy savings by providing full illumination only during class change times while class is in session approximately 75% of common area lighting should be off.

F. Activation of security and fire alarm systems shall turn on all exterior lighting as well as all common area lighting.

G. Provide safety chain or cable for all pendant mounted fixtures.

H. Provide wire guards for all fixtures and devices in gymnasiums and multipurpose activity rooms or use fixtures that are impact resistant.

I. Provide night time blackout capability tied to motion activation.

Part 2- Products

2.01 Lighting Products

A. Keyed light switches shall be 20 amp, 120/277 volt specification grade by Leviton or MSBSD approved equal. All other switches shall be specification grade.

B. Install motion sensor switches in storage rooms and restrooms.

C. Stage lighting and dimming sets should be coordinated with MSBSD.

D. Panel boards, contactors, disconnects and other electrical equipment shall not be used as a junction box.

26 51 00 Indoor Lighting

Part 1- General

1.01 Lighting Requirements

A. LED lighting is preferred for all applications.

B. Spaces with interactive white boards shall have an additional light switch capable of turning lights off that are adjacent to interactive white boards for events such as audio/visual presentations. The switch shall also be located adjacent to the interactive white board.

C. All wiring for lights shall be J-box to light wiring.

D. The MSBSD will not accept light to light wiring or tandem wired fixtures. Prefabricated modular connectors for light wiring systems are not acceptable.

E. No lighting fixtures shall be installed over stairs, only over landings.

26 52 00 Emergency Lighting

Part 1- General

1.01 Requirements

A. For mechanical and electrical rooms do not put on occupancy sensor or any other automatic control. For mechanical and electrical rooms put every fixture in the room on standby power and control with a local switch.

26 56 00 Exterior Lighting

Part 1- General

1.01 Design Criteria

A. Exterior lighting will be provided to illuminate School grounds in support of the safety and security of Students, Faculty, and Staff.

B. Exterior lighting shall be installed at the Faculty & Staff employee entry and at the exterior vehicle gate to provide adequate safety and security lighting when locking up and leaving the facility after the exterior lighting is off due to the “black-out” policy. Custodial lighting will be on a dedicated lighting circuit.

C. Exterior display and area lights shall not be ground mounted.

D. Driven pile foundations for parking lot light poles is preferred.

E. Verify with MSBSD which site lights are to be turned on through a remote connection via cell phone.

F. Provide electrical circuit for each of the following areas: general parking, staff parking, bus loop, gate / loading dock and flag pole.

G. Provide separate automation points to incorporate separate zones for the following areas:

1. Custodial and building lights
2. General parking
3. Staff parking
4. Bus loop/drop off area
5. Flag Pole

H. All lighting to be LED

I. Dock lights should illuminate dock and egress route to parking.

J. Dock lights should be motion activated.

K. No underground junction boxes shall be allowed for site distribution, lighting, etc.

L. Use of subsurface lights is not allowed

M. Limit use of architectural lighting to utilitarian requirements.

N. Fixtures to meet or exceed IES BUG ratings

O. Fixtures to carry at least 10 year warranty on components and finish.

P. Poles to meet or exceed 120mph wind rating

Q. Light flag pole to prevailing wind

R. Face lighting controls photo cell to the East

26 56 16 Parking Lighting

Part 1- General

1.01 Summary

A. Illuminate roads, driveways, and entries/exits for safe movement of vehicular traffic

B. Facilitates the use of lighting for IP Security Camera

26 56 33 Walkway Lighting

Part 1- General

1.01 Summary

A. Illuminate sidewalks, pathways and entries/exits for safe movement of pedestrian traffic

B. Avoid the use of ground mounted fixtures

Division 27- Communications

27 00 00 Communications

Part 1- General

1.01 Description

A. All work shall be to current code and inspected by State of Alaska Electrical Inspector.

B. Provide appropriate audio/video connections from interactive white board to staff workstation location in accordance with appendix IT-008.

C. Provide conduit with labeled pull wires installed for future installation of cables for video security systems and computer networking. Provide cable trap when directed by MSBSD. Provide spare conduits for future relocatable classrooms.

1. Colors for J-Box covers:

a. CCTV - Green

b. Intercom- Pink

c. Computer - Blue

D. Major assembly areas (gymnasium and commons in elementary schools) shall have built in sound reinforcement system to include microphone mixer with knobs for channel volumes plus master volume, 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. Audio system must be tied to intercom system. All audio equipment must be serviceable by the AV department without factory training. Provide USB port to import media from other sources.

E. Provide Network Infrastructure installed as follows:

1. Provide MDF and IDF(s) when appropriate. The MDF must be sized to accommodate all systems phones, alarms, security, and access control. Provisions for a workbench area must also be provided adjacent to the either the MDF/IDF with corridor access. Consult with MSBSD for most efficient placement and configurations.

2. Define and label these rooms as IT closets MDF, IDF and IT Support vs. storage or records.

3. Provide minimum 16 network surface-mounted data cables per classroom or 4-8 drops per office in conduit with home-run to IDF or MDF (based upon function of room). Wall jacks shall be located in the academic spaces by the Architect and clearly labeled. All hardware shall meet the current MSBSD specifications in appendix IT-003. All drop locations are subject to review and approval by MSBSD.

4. No powered Network equipment will be installed above ceiling. Power over Ethernet allowed where appropriate.
5. All network switches shall be installed in the MDF / IDF all horizontal cable runs will be home runs from end station to patch panel.
6. Fiber interconnects between MDF and IDFs must be a minimum of 12-pair Changes to be approved by MSBSD IT. Refer to Appendix IT-004 for current fiber optic cabling specifications.
7. Switch-to-field wiring will be via modular jack field High density patch panel. Jack field will be clearly and permanently marked in accordance with MSBSD horizontal cabling labeling standards appendix (IT-001). Patch cables will be of the same specification as horizontal cabling described in Appendix IT-003.
8. All proposed connections including portables and other out-buildings must meet current standards including distances to MDF or IDF.
9. Air conditioning required in all MDF/IDF rooms, preferably mounted overhead, but not directly over equipment rack(s). Provide separate power circuit for air conditioning equipment.
10. Ceiling terminated Ethernet jacks to be determined by MSBSD for wireless access point locations.
11. All deviations and substitutions will need prior approval from the MSBSD.
12. In all MDF's and IDF's provide patch panels in accordance with MSBSD network infrastructure standards Appendix IT-002.
13. Horizontal cable coloring for systems will follow the standards set forth in the horizontal cable standards, Appendix IT-001.
14. Functionality throughout the building including mechanical, office, common areas, and instructional spaces of wireless connectivity must be taken into account in the design of the facility.

F. 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, phone system and Lenel security panels. UPS must meet IT specifications. Specifications will be updated as necessary by MSBSD. Refer to appendix IT-005.

G. Provide for Video Security System. Verify with Owner current MSBSD standards for security camera equipment. Refer to appendices IT-009. IT-010, IT-011, IT-012, IT-013, IT-014, IT-015.

H. Provide for Video Security System or Surveillance. Verify with MSBSD current standards for proprietary surveillance camera equipment.

I. The MDF shall have 2 minimum L530 electrical outlets for UPS's for Security camera system, routers and identified switches on generator power.

J. The rapid evolution of technology and equipment requires all equipment and designs for security, communication, surveillance and computer systems be reviewed and approved by MSBSD.

K. Network redline drawings shall be posted on Architectural E size (36" x 48") paper for each MDF, and IDF in their respective locations placed behind plexiglass for reference purposes.

1.02 Access

A. Access for operation, maintenance, repair or replacement of any equipment or item is very important. Mechanical access will be off common areas. With this in mind, the words access as used in this standard should allow someone to be able to operate, maintain, repair or replace such equipment or item without disassembly or damage to the surrounding installation.

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 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. Consider the use of lifting cranes for heavy equipment and the need for larger access doors to upper areas with larger equipment.

C. MDF/IDF - Racks within MDFs and IDFs will require 4’0” on all navigable sides. Consult with MSBSD for placement and configuration of racks and types. Both four (4) post and two (2) post racks are used. Also note vertical cable management and make necessary space accommodations for Category 6A cable.

D. MDF location will be ground level. IDFs will be located as necessary to accommodate proper horizontal cabling length standards.

Part 2- Products

2.01 Communication Products

A. Master-clock with slave-clocks and solid-state bell program system by Rauland Telecenter ICS-2 or MSBSD approved equal. A Rauland ICS-2 intercom system will be used as a master clock controller for all digital and analog secondary clocks. A Rauland Atomic clock will be connected to the Rauland ICS-2. All clock power supplies will be Rauland 2416 and will be mounted next to the intercom system, within five (5) feet of the floor.

B. Voice enhancement system standards are set forth in appendix IT-016.

C. Coordinate with MSBSD to verify whether switched hubs are in construction package or provided separately as technology or equipment purchases.

D. To ensure educational price savings are applied, contractor(s) must coordinate with MSBSD to compare costs prior to purchase of voice enhancement system through MSBSD vendor(s) pricing arrangements to ensure best possible savings.

E. Coordinate with MSBSD to verify whether voice enhancement systems (four speakers, receiver, pendant microphone, wiring, mounting shelf for receiver) are in construction package or provided separately as technology or equipment purchases. Must meet MSBSD specifications. Specifications will be updated as necessary. The current MSBSD specification is the Promethean ActivSound.

F. MSBSD standard fiber specs refer to appendix IT-004.

G. MSBSD standard and quantity for racks

1. Must work with MSBSD to determine type, quantity, and layout of equipment racks in MDF/IDF.
2. Four (4) Rack Units of space should be reserved at the top in each rack for MSBSD owned equipment.
3. All racks in the room should be labeled with a laminated sign stating, “Reserved for School Equipment”.
4. Rack A is reserved for phone, intercom, television, and horizontal cabling. Adequate cable management should be available for all equipment.
5. Rack B is reserved for horizontal cabling, fiber backbone, wireless, switches and if designed in construction documents space is provided for CAT6a backbone. POE Switch and separate patch panel with cable management unit is allowed in this rack with the server positioned on a table near to the rack.
6. Rack C is reserved for horizontal cabling and MSBSD servers. Servers should have a shelf to support a monitor and keyboard.
7. Rack D should have one spare rack dedicated to MSBSD supplied equipment.
8. For every 48 patch panel and coordinating 2RU cable management panel there should be 2RU space available for MSBSD installed switches.
9. MSBSD standard for interconnects between MDF and IDF
    a. Fiber interconnects terminated and marked to all IDFs.
    b. 12-strand 50 micron multimode aqua. Distances not to exceed distance requirements for 10-gig fiber, 50 micron.

H. MSBSD standard for interconnects between MDF and IDF:

1. Fiber interconnects terminated and marked to all IDFs.
2. Utilizing 24-strand in accordance with current specifications.
3. Distances not to exceed distance requirements for current specified standards in appendix IT-004.

I. Four each 30 amp L5-30 power on back wall behind racks. At least two connected to emergency power generator. Each should be clearly labeled as “E power” or otherwise.

J. Two UPS (one with battery pack and temperature and environmental probes) L5-30 connectors.

K. For MSBSD standard for UPS refer to appendix IT-005.

L. MSBSD provided equipment switching equipment, router, and any proprietary network equipment associated.

M. Contractor provided equipment shall be all Fiber and Copper patch cables in accordance with current MSBSD Standards. Consult with MSBSD for quantities, lengths, and color standards. Refer to appendix IT-001, IT-003, IT-004.

N. Verify with MSBSD for any updates or changes to equipment. Specifications will be approved by MSBSD. See appendices IT-009. IT-010, IT-011, IT-012, IT-013, IT-014, IT-015 Refer to appendix spec sheet.

O. Interactive boards require Ethernet adjacent to every audio/video staff workstation. Refer to appendix IT-008 online.

2.02 Projection Screens

A. Contractor will provide large ceiling mounted projection screen (glass beaded or mat white) on stage in MPR or equivalent room. Verify specific criteria with MSBSD for individual projects.

B. Coordinate requirements for smaller specialty screens with MSBSD.

C. Projection screens will not be provided in individual classrooms.

D. Rear-Projection Screens

1. Manually operated projection screens should be Manufacturer's standard spring-roller-operated units, consisting of case, screen, mounting accessories, and other components necessary for a complete installation.

   a. Fully recessed unit.

   b. Units should have stainless-steel tensioning cables on both sides of screen connected to edges of screen by tabs to pull screen flat horizontally.

2. Flexible rear screen stage should be equal to Da Lite "Tension Advantage Electrol" electric motorized projection screen and Draper "Acess/ Series V" electric motorized projection screen.

3. Fully recessed metal encased, manually operated screens should be designed and fabricated for surface mounting in ceiling. Provide bottom closure panel suitable for mounting in Gypsum Board ceiling or suspended acoustical ceiling panel system

4. Screen material and viewing surface should be neutral density grey viewing surface.

5. Screen should be electrically operated, UL and ULC listed, retractable, with one (1) rigid metal roller and tab guide cable screen tensioning system.

6. The motor shall be housed inside metal roller and include automatic thermal overload protection, integral gears, capacitor and electric brake to prevent coasting.

a. 3-wire ground with quick connect male plug-in connector, permanently lubricated, quick reversal type designed for mounting inside roller.

b. 115 V, 60 Hz

c. 2.4 amps maximum

d. Must include preset, adjustable limit switches to automatically stop viewing surface in Up and Down position.

e. Wall mounted switch.

f. Three (3) position switch with cover plate for Up, Down and Stop functions

g. Junction box should be internally attached to screen case

h. The core of the Key switch shall be keyed to match building system

7. Screen mounting shall be ceiling recessed and plenum rated type

8. Include mounting hardware

9. Metal screen case should be designed to receive mounting hardware and sized to suit projection screen

a. Type 1, extruded aluminum with heavy gage steel end caps and adjustable steel brackets

b. Case bottom should be self-trimming with built-in flange and equipped with concealed hinge aluminum door for manual access.

c. White powder coated finish

10. Screen size should be H 100 inches x W 160 inches

11. Viewing angle shall be 30 degrees

Part 3- Installation

3.01 Communication Installation

A. Provide two (2) ea. 4” conduits from telecom hand hole to MDF demarcation point, provide 4” conduit between MDF and IDF locations with an additional 4” conduit for later expansion.

B. Buildings are wired in star topology to MDF/IDF(s) and must meet current cable standards. All Network wires are home-run to MDF or IDF. Classrooms are given a minimum of two each 2-pack drops on each wall and no less than 16 drops total per classroom terminated in MDF or IDF.

C. All IDFs connect to MDF via fiber connect according to current MSBSD standards. Refer to appendix IT-004.

D. Four (4) speakers will be mounted in an equidistant square pattern throughout the learning space. Speaker wiring will be installed and properly supported to code specification above the drop ceiling. Conduit will be installed to connect speaker wires

to an audio/video connection near staff workstation. Shelf (included with purchase of system) will be installed above teacher's desk to support classroom audio system.

E. Intercom override for emergency notification.

27 51 16 Public Address and Mass Notification Systems

Part 1- General

1.01 Description

A. The Contractor shall furnish, install, and place in operation a complete electrically powered audio amplification system for sound reinforcement for each of the following areas:

1. Gymnasium/Music and Multipurpose. Each system shall include, but not be limited to, amplifiers, speakers, mixers, microphones, rack, enclosures, equalizers, cables and accessories required to provide a complete and operable system.

B. The Contractor shall furnish and install rough-in provisions (conduit and back boxes) for a sound reinforcement system in the following areas:

1. Gymnasium/Music Room and Multipurpose.

1.02 Codes

A. All wiring shall be in accordance with the requirements of the National Electric Code (NEC).

1.03 Type of System

A. Specifications are based on companies having at least five years successful experience in the manufacturing of similar equipment and provided that sufficient documentation is provided to the MSBSD which certifies that the equipment meets the requirements of this Section.

1.04 Guarantee and Service

A. All components, parts, and assemblies supplied by the manufacturer shall be guaranteed against defects in materials and workmanship for a period of 12 months.

B. The equipment distributer shall offer the MSBSD an annual service contract at the end of the one-year warranty period. Acceptance or rejection of the service contract will be the MSBSD's option.

Part 2- Products

2.01 PA System Requirements

A. CD Player

B. MP3 Input

C. Handheld Microphone

D. Wireless Microphone System

E. Integrated Mixer/Amplifier/CD Player

F. Six Channel Mixer

G. Digital Signal Processor

H. Power Amplifier

I. Equipment rack (Wall Mounted Enclosure)

J. Equipment rack (Floor Mounted Enclosure)

K. Loud Speakers (Ceiling Mounted)

L. Loud Speakers (Wall Mounted)

M. Accessories

1. 70V to Line Level Transformer
2. Direct Box
3. Audio Control Relay
4. Cables
    a. Microphone, 25 feet
    b. Rack mounted equipment
    c. Furnish interconnecting cables as required.
    d. Loudspeaker cables shall be West Penn 227 or as approved
5. Microphone Floor Stand
6. Microphone Receptacles
7. Surge Suppression

Part 3- Execution

3.01 Operation (General)

A. During an intercom page to the area served by the sound system, the sound system shall mute temporarily the other audio sources and broadcast the page.

B. The compact disk shall be remotely controlled via hand held remote control.

3.02 Multipurpose Room Sound System

A. The system shall amplify and distribute program sources and shall include the following equipment as noted below or on the Drawings

1. Rack mounted wall in cabinet
    a. Digital signal processor (1)
    b. Power amplifier

c. CD Player

d. MP3 Input

e. Wireless Microphone System (Provide separate frequencies for adjacent areas)

f. Microphone Outlets (3)

2. Loud Speakers

a. Wall mount, TOA Model F-2000, or as approved

3. Powered Antenna

4. Source select, volume control

a. BIAMP Volume/Select 8, or as approved

5. Accessories as noted below or on the Drawings

a. Microphones

1. Wireless Lavalier (1)

2. Wireless Headset (1)

3. Handheld (2)

4. Pendant Ceiling (6)

b. Microphone Floor Stand (1)

c. Microphone Cable, 25-feet (1)

d. Microphone Cable, 10-feet (1)

e. Audio from intercom paging system

1. 70V to Line Level Transformer

2. Audio Control Transformer

3.03 Music/Gym Sound System

A. The system shall amplify and distribute program sources and shall include the following equipment as noted below or on the Drawings:

1. Rack mounted in floor cabinet in Music Room

a. Digital signal processor (1)

b. Power amplifier

c. CD Player

d. MP3 Input

e. Wireless Microphone System (Provide separate frequencies for adjacent areas)

f. Microphone Outlet (2)

2. Desk mounted in wall cabinet in Gym Office

a. CD Player

b. AM/FM Tuner

c. MP3 Input

3. Speakers

a. Wall mount, TOA Model F-2000, or as approved

b. Ceiling mount, TOA Model F-2852C, or as approved

4. Powered Antenna (2)

5. Source select, volume control

a. BIAMP Volume/Select 8, or as approved

6. Accessories as noted below or on the Drawings

a. Microphones

1. Wireless Lavalier (1)

2. Wireless Handheld (1)

3. Handheld (1)

b. Microphone Floor Stand (2)

c. Microphone Cable, 25-feet (2)

d. Microphone Cable, 10-feet (1)

e. Audio from intercom paging system

1. 70V to Line Level Transformer

2. Audio Control Transformer

B. Coordinate Gym Office source rack height and exact location with Contracting Agency prior to rough-in.

3.04 Installation

A. Refer to the applicable one-line diagrams on the Drawings for system interconnections.

B. The Contractor shall supply all racks, wire, hardware, conduit, etc., required for the installation, and needed to provide completed usable sound systems.

C. All equipment except portable equipment shall be firmly held in place. This shall include loudspeakers, enclosures, amplifiers, cables, etc. Fastenings and supports shall be adequate to support their loads with a safety factor of at least three. All switches, connectors, hacks and receptacles shall be clearly, logically and permanently marked. All wires and cables shall be identified at every termination and connection point with permanent type markers. All equipment shall be shock isolated for seismic conditions according to codes and regulations.

D. The Contractor shall take such precautions as are necessary to prevent and guard against electromagnetic and electrostatic hum, to supply adequate ventilation, and to install the equipment so that it shall be safely operated.

E. Care shall be exercised in wiring, to avoid damage to the cables and to the equipment. All joints and connections shall be made with rosin-core solder, or with approved mechanical connectors. All wiring shall be executed in strict adherence to standard broadcast policies.

F. Lines shall be run in separate ferrous conduits for microphone level circuits (levels below minus 20 dBm), line level circuits (up to plus 30 dBm), loudspeaker circuits (above plus 30 dBm), and power circuits. All other conduits shall be spaced not less than two inches from power conduits.

G. Power conduits shall be bonded to the power system ground system. Power system conduits shall not be connected to the racks or to the audio system ground.

H. Microphone and 600-ohm lines shall be insulated from the conduit and from each other for the entire conduit length. Microphone and 600-ohm line conduits shall be electrically grounded to the audio system ground point. Cables in conduit shall not be spliced.

I. Low voltage D.C. for relay control or power supply shall be run in any conduit, except microphone line conduit.

J. The installation of all work shall be neat. All boxes, equipment, etc. shall be plumb and square.

K. The Contractor shall keep the job adequately staffed at all times, including a designated field supervisor present on the job site, and in responsible charge during all phases of installation and checkout. This supervisor shall be the same individual throughout the execution of the work, unless circumstances beyond the control of the Contractor intervene.

L. It shall be the responsibility Contractor to cooperate with the MSBSD in order to achieve well-coordinated progress and satisfactory results. The Contractor shall schedule his work to prevent conflicts with other activities in the building.

M. For all drivers, red terminal (+) on driver, shall be connected to red terminal (+) on the power amplifier, black terminal (-) on driver, shall be connected to black (-) terminal on power amplifier.

27 51 23.50 Educational Intercommunications and Program Systems

Part 1- General

1.01 Description

A. The Contractor shall furnish, install, and place in operation an electrically powered, Intercommunication/Clock/Program system for paging, program signaling, internal and external intercom, telephone inter-communication, and monitoring of various classrooms

throughout the building. The systems shall include, but not be limited to master controller, CD player, USB port, amplifiers, power supplies, peripheral instruments, clocks, speakers, administrative telephones, baffles, wire and accessories required to provide a complete and operational system.

B. The telephone system will be provided by the MSBSD under separate contract. Coordinate with the MSBSD for information on phone system manufacturer and model. Provide all coordination with the telephone system to implement the system integration and telephone system performance requirements noted herein.

C. The Intercom system shall be integrated with the telephone system as described herein.

1.02 Codes

A. All wiring shall be in accordance with the requirements of Article 725 of the National Electrical Code for Class 2 Signaling Systems, applicable local codes and manufacturer's wiring diagram.

1.03 Type of System

A. Intercom systems for secondary schools shall be Rauland Telecenter ICS or functional equivalent. Intercom for elementary schools shall be Rauland ICS or functional equivalent. Intercom systems for all schools shall be Rauland ICS-2. All clocks installed in elementary schools shall have a standard analog face but can have a digital control mechanism.

1.04 Integration With Telephone System

A. Access to the Intercom system control function from the telephone system shall be restricted to "Administrator" PBX telephones. One trunk on the intercom shall access the control privileges. The telephone system shall restrict which telephone can call into that intercom trunk. MSBSD will provide telephone instruments. Telephone instruments shall be connected to the building telephone switch. System integration shall be provided under this Section.

B. Sequence of Operations

1. Calls from any telephone to any classroom speaker shall be made by dialing the proper classroom speaker extension number from the telephone.

2. Calls from any telephone to any other telephone shall be made by dialing the proper extension number.

3. Outside calls shall be able to be placed from any telephone.

4. Intercom control functions shall be accessed via administrator's PBX telephones with control privileges in conjunction with an intercom system digital display (either telephone or wall mounted to provide visual feedback as the intercom control menus are accessed.

5. Any call shall be able to be conferenced between the caller, the teacher, student or staff person, and the Principal or other administrator.

6. Dialing the classroom telephone shall be done by dialing the extension only. The classroom speaker shall be accessed by first pressing a “feature” button on features phones, or entering an access code on analog telephones, and then dialing the classroom extension.
7. Routine calls from classrooms shall be able to be placed from either telephones or “normal” intercom call-in pushbuttons, with the latter allowing hands-free two-way conversations.

1.05 Owner’s Manuals

A. Furnish two (2) complete sets of Owner’s Operation and Maintenance manuals and other information necessary for use and upkeep of the system along with one (1) digital copy. Manuals shall be completed and approved prior to Operator’s training.

1.06 Guarantee and Service

A. All components, parts, and assemblies supplied by the manufacturer shall be guaranteed against defects in materials and workmanship for a period of 12 months from the date of final acceptance.
   1. Warranty service shall be provided by a trained specialist of the equipment manufacturer.
   2. The specialist shall be based in a fully-staffed branch office located within a reasonable distance from the job site.

B. The equipment manufacturer shall have a local branch office staffed with trained, full-time factory certified employees who are capable of performing testing, inspection, repair, and maintenance services for the life of the system. Factory certification must be submitted to the MSBSD prior to acceptance of the system.

C. The equipment distributer shall offer the MSBSD and annual service contract at the end of the one-year warranty period. Acceptance or rejection of the service contract will be the MSBSD’s option.
   1. Time Clocks
   2. Electromechanical time clocks are not acceptable.
   3. Clock power supplies are to be mounted near intercom head end rack.
   4. All conduits 1 ¼ and larger shall be insulated throat type.

Part 2- Products

2.01 Manufacturers

A. Telecenter ICS manufactured by Rauland-Borg Corp

2.02 System Requirements

A. The system shall provide the state of the art in technology for all internal intercom communications, emergency call-in notification, secondary clock corrections, and bell schedule. The system shall be easy to learn and operate. All standard system

programming shall be user friendly to allow the system administrator the ability to easily program system features.

B. Features offered by this system shall be implemented and controlled by software programs that can be changed and expanded as customer needs evolve.

C. The system shall be equipped with voice prompting, allowing the administrative user to distinguish between an internal intercom call from a room station and a telephone call from another telephone call from another telephone or outside trunk.

D. Two-way communication between any telephone and any room speaker.

E. Room speakers, call switches, and telephone extension numbers shall be programmable and may be assigned any three digit number. Each dialing administrative telephone in the system shall be programmable for the following options:

1. Allow access to C.O. or external system trunks.
2. Allow toll calls.
3. Allow zone paging.
4. Allow All-Page Announcements.
5. Allow Executive Override.
6. Allow Emergency paging.
7. Allow activation of Time Zone tones.
8. Set the priority level and target display of “normal” calls.
9. Set the priority level and target display of “emergency” calls.
10. Assignment of architectural number.
11. Class of Service.
12. Assignment of associated speaker to paging zone.
13. Automatic Call-Back-Busy.
14. Call Forward- No Answer.
15. Call Forward- Busy.
16. Call Forward- Always.

F. The system shall be UL listed to the UL 1950 Third Edition standard.

2.03 Equipment and Materials

A. Central Controller Unit

B. Administrative Telephone

1. Fully digital, multi-line telephone.
2. One button dialing of most commonly dialed number or numbers

3. Facilities for transferring calls.
4. Facilities for placing a call on hold and privacy on all calls.
5. Provide message waiting.
6. Facilities to unlock remote doors.
7. Facilities to arm/disarm security features, such as door/window contact monitoring, motion detectors or any normally open contact.

C. Emergency/Normal Call Switch

1. Provide one (1) “Normal” call switch that shall activate a distinctive “NORM” level call from single button activation. Button shall be clearly marked “NORM” and shall route call to any one or more Administrative Telephones and/or Displays for quick and easy response from and Administrative Telephone. In accordance with the Americans with Disabilities Act (ADA), the “Normal” call will provide a steady call assurance LED confirming that the call has been placed in the system.

D. Program Distribution System

1. The system shall provide facilities to distribute program in the following manner.
   a. The media operator shall cue remotely located music source.
   b. The media operator shall dial from an Administrative Telephone to select the room(s) or areas to distribute program.
2. Power amplifiers shall meet all specifications exactly as specified herein, including power capacity and count, provide a minimum of ½ watt power to all intercom speaker locations plus 15 watts power to all horn type speaker locations.

E. Time Programming

1. Non-volatile memory capacity for storing 550 events and up to 100 Calendar dates for schedule changes.
2. Ability to review, edit and delete events via a computer running the configure program.
3. Review events from any entered time of day.
4. Events shall be programmable to any or all of eight (8) zone circuits.
5. Selection of any of eight (8) schedules to allow flexibility due to seasonal changes or special events.
6. Fully automatic calendar execution.
7. User programmable automatic daylights savings time change.
8. Programmable Music-on-Class-Change. This feature shall be programmable from 1 to 3600 seconds (60 minutes).
9. Separate bell-tone selection and separate bell duration for each event.

F. Data Logging

1. The System Log shall contain all events that occurred in the system for which event logging has been enabled to diagnose or document system usage.
2. Shows for each day-of-the-week the times-of-the-day when the system configuration modes change.
3. The System Log Dump report shall list all events that occurred in the system for which event logging has been enabled to diagnose of document system usage.
4. System shall be self-monitoring. System shall include a background process dedicated to self-monitoring.

G. Hallway Baffle and Enclosure

1. The hallway baffle shall be a Rauland ACC1000 or MSBSD approved. The baffle shall be constructed of 22-gauge cold rolled steel; zinc treated, and have a semi-gloss white baked epoxy finish. The baffle shall have a diameter of 12-7/8 inches.
2. The metal protective enclosure shall be a Rauland ACC1101 or MSBSD approved. The enclosure shall have a rust preventive coating. Interior of enclosure shall be undercoated to prevent mechanical and acoustical resonance.
3. Provide ceilings tile bridges Rauland ACC1104 or MSBSD approved.

H. Gymnasium paging speakers shall be Rauland Model USO188 with ACC1003 baffle and ACC1112 enclosure.

2.04 Complete System

A. As it is not practical to enumerate in these specifications all details of fittings and accessory equipment required for proper operation of the system herein described, it is understood that they will be supplied by the Contractor without extra compensation.

B. All fittings, terminations, amplifiers, relays, switches, wiring, conduit, functional modules, custom programming and fabrication, testing and balancing, etc., needed to provide the best performance possible at the present state of the art shall be supplied at no additional cost.

2.05 Overvoltage Protection

A. Head-end equipment shall incorporate a device to protect all solid state equipment against power line surges and power line over-voltages.

Part 3- Execution

3.01 Installation

A. Mount Intercom/Clock Control Panel enclosure in the MDF, where it is accessible only by authorized personnel, as shown on plans.

B. Mount a floor standing rack containing the program sources and monitor panel in the office area designated on the plans.

C. Refer to Architectural elevations and reflected ceiling plans and electrical drawings for locations and mounting heights of devices and equipment. Coordinate special framing or mounting requirements with other trades for proper installation.

D. All connections to the Intercom/Clock Control Panel shall be via 25 pair cables to the punch down blocks located on the rack.

3.02 Wiring Requirements

A. All wiring shall be in conduit or cable tray.

B. All wiring shall be sized per the manufacturer's recommendations. Each type shall be approved for the specific application.

C. Use color coding of conductors and apply wire and cable marking tape to designate wires and cable so all media are identified in coordination with system wiring diagrams.

3.03 Paging Zones

A. Provide individual speaker paging zones as follows or as directed by school administration: (confirm zones with MSBSD's Representative)

1. Administration area
2. Classrooms
3. Multi-Purpose room
4. Stage
5. Library
6. Corridors and rest rooms
7. Gym
8. Exterior

3.04 System Testing and Balancing

A. The system shall be fully tested and balanced by a qualified technician prior to final acceptance. Make all final adjustments to the system to the satisfaction of the MSBSD.

B. Provide a list of all phone numbers, speaker numbers, and zone numbers and punch down configuration.

C. When requested by the Architect within one year of date of Substantial Completion, provide on-site assistance in adjusting sound levels, resetting matching transformer taps, and adjusting controls to suit actual occupied conditions. Provide up to three visits to the site for this purpose.

3.05 Priority Processing List

A. The priority of the switch determines its access to Telecenter ICS resources. NOTE: In case of a dial string executing a dial code function, the priority defines for the switch will take precedence over the priority of the dial code.

- Control Type Switches and Supervision Fault (The **highest** processing priority)
- Emergency Page from Microphone
- Emergency Page from Telephone
- Executive Override
- Switch Priority 1 FIRE
- Switch Priority 2 DURESS
- Switch Priority 3
- Switch Priority 4
- Time Tones
- Dial-Up Tones
- All Page
- Zone Page
- Intercom
- Switch Priority 5
- Switch Priority 6
- Switch Priority 7
- Switch Priority 8
- Switch Priority 9
- Switch Priority 10
- Switch Priority 11
- Switch Priority 12
- Switch Priority 13
- Switch Priority 14
- Switch Priority 15
- Switch Priority 16
- Call Placed Tone
- Music-On-Class-Change
- Program Distribution (The **lowest** processing priority)

Word List for Voice Chip (Rauland Model EN01)

ZERO	0	BACK	51	FOR	102	NOW	153	STAR	204
ONE	1	BATHROOM	52	FROM	103	NUMBER	154	STATION	205
TWO	2	BELL	53	FRONT	104	NURSE	155	SUMMER	206
THREE	3	BELLS	54	FULL	105	OF	156	SUPERVISION	207
FOUR	4	BOYS	55	GARAGE	106	OFF	157	SYSTEM	208
FIVE	5	BREAK	56	GIRLS	107	OFFICE	158	TAKE	209
SIX	6	BUILDING	57	GROUP	108	OH	159	TEACHER	210
SEVEN	7	BUS	58	GYM	109	OLD	160	TELEPHONE	211
EIGHT	8	BUSY	59	HALF	110	ON	161	TERM	212
NINE	9	BY	60	HALLWAY	111	OPEN	162	THAT	213
SUNDAY	10	BYPASS	61	HAS	112	OR	163	THE	214
MONDAY	11	CAFETERIA	62	HAVE	113	OUT	164	THEATER	215
TUESDAY	12	CAFETORIUM	63	HELP	114	OUTSIDE	165	THROUGH	216
WEDNESDAY	13	CALL	64	HIGH	115	OVERRIDE	166	TIME	217
THURSDAY	14	CALLING	65	HOLIDAY	116	PAGE	167	TO	218
FRIDAY	15	CALMLY	66	HOME	117	PASSWORD	168	TONE	219
SATURDAY	16	CANCEL	67	HOURS	118	PLEASE	169	TONES	220
JANUARY	17	CELL	68	IN	119	POUND	170	TRANSFER	221
FEBRUARY	18	CHANGE	69	INSIDE	120	PRESS	171	TRY	222
MARCH	19	CHILDREN	70	INSTITUTE	121	PRIORITY	172	TURN	223
APRIL	20	CLASSROOM	71	INTERCOM	122	PRIVACY	173	USE	224
MAY	21	CLEARED	72	INTERRUPT	123	PROCEED	174	USER	225
JUNE	22	CONFIGURATIO	73	INTRUDER	124	PROGRAM	175	UTILITY	226
JULY	23	CONFIRM	74	INTRUSION	125	PUSH	176	VALID	227
AUGUST	24	CORRIDOR	75	INVALID	126	QUIETLY	177	VERSION	228
SEPTEMBER	25	COVER	76	IS	127	READY	178	WEST	229
OCTOBER	26	CURRENT	77	JUNIOR	128	REAR	179	WINTER	230
NOVEMBER	27	DATE	78	KEY	129	RECESS	180	WITHIN	231
DECEMBER	28	DAY	79	KITCHEN	130	REENTER	181	WOOD	232
AM	29	DIAL	80	LATER	131	REMAIN	182	YEAR	233
PM	30	DIGIT	81	LEAVE	132	RESET	183	YOUR	234
A	31	DISARMED	82	LIBRARY	133	RESTROOM	184	ZONE	235
ACCEPTED	32	DISTRIBUTION	83	LINE	134	RINGING	185	ZONES	236
ACTIVE	33	DOCTOR	84	LUNCH	135	ROOM	186		
AGAIN	34	DOOR	85	MAIN	136	ROUTINE	187		
ALARM	35	EAST	86	MIDDLE	137	SCHEDULE	188		
ALERT	36	ELEMENTARY	87	MINUTES	138	SCHEDULES	189		
ALL	37	ELEVATOR	88	MONTH	139	SCHOOL	190		
ALREADY	38	EMERGENCY	89	MORE	140	SCROLL	191		
AN	39	END	90	MORNING	141	SECONDS	192		
AND	40	ENTER	91	MULTIPLE	142	SECURITY	193		
ANSWER	41	ENTRY	92	MULTIPURPO	143	SELECT	194		
ANY	42	EVACUATE	93	MUSIC	144	SEND	195		
ARE	43	EVENING	94	MUST	145	SET	196		
AREA	44	EXIT	95	NEW	146	SHOP	197		
ARMED	45	EXTENSION	96	NEXT	147	SHORT	198		
ASSEMBLY	46	FALL	97	NIGHT	148	SIDE	199		
AUDITORIUM	47	FAULT	98	NO	149	SOUTH	200		
AUTO	48	FIRE	99	NORMAL	150	SPECIAL	201		
AUTOMATIC	49	FLOOR	100	NORTH	151	SPRING	202		
AWAY	50	FOLLOWED	101	NOT	152	STAIRWAY	203		

Division 28- Electronic Safety and Security

28 00 00 Electronic Safety and Security

Part 1- General

1.01 Security System Information

A. Security camera specifications are outlined in appendix IT-009.

B. Verify with MSBSD for any updates of changes to equipment and standards prior to design completion.

C. Contractor must provide camera licenses in coordination with MSBSD.

D. Verify with MSBSD for any updates of changes to equipment and standards prior to design completion.

E. To ensure educational price savings are applied, contractor(s) must coordinate with MSBSD to compare costs prior to purchase of hardware and licensing through MSBSD vendor(s) pricing arrangements to ensure best possible savings.

F. Security equipment and systems must be IP based. CCTV is no longer acceptable.

28 10 00 Electronic Access Control and Intrusion Detection

Part 1- General

1.01 Security Management System Description

A. The Security Management System outlined is the key central component for managing physical security and the bridge between physical and logical security for this project. The system shall provide a variety of integral functions including the ability to regulate access and egress; provide identification credentials; monitor, track and interface alarms.

1.02 Quality Control

A. The manufacturer shall be an established organization with referenced and documented experience delivering and maintaining Security Management Systems of equal or higher sophistication.

B. O&M Manuals must be provided

1. Hardware manual
2. Software manual
3. Operators Manual
4. Maintenance Manual

C. Must provide As-Built Drawings

Part 2- Products

2.01 Manufacturers

A. SMS Software

1. Lenel Systems International or MSBSD approved equal.

B. SMS Field Hardware

1. Lenel Systems International or MSBSD approved equal.

C. SMS Authentication Hardware

1. HID, iClass 13.56 MHz contactless Smart Card

D. SMS Third Party Integrated Devices

1. The SMS shall seamlessly interface with devices from the following manufacturers

a. Radionics/Bosch

b. Zenitel

c. Visonics

d. Honeywell

e. Osborne Hoffman

f. EST

g. Notifier

h. Pyrotronics

28 13 26 Access Control Remote Devices

Part 1- General

1.01 Lock-Down button functional description

A. When the lock-down button is pressed a number of events are initiated:

1. Locks the card reader access controlled doors which were in an unlocked state during normal hours

2. Drops power to electromagnetic door hold-opens, causing those interior doors to swing shut and lock.

3. Lock-down buttons shall be installed in designated Administrative Offices to lock associated access controlled exterior doors and close associated hold-open doors.

1.02 Duress button functional description

A. Duress button shall be installed in designated Administrative Offices to initiate alarm signaling to the commercial central station monitoring service, play a pre-recorded PA system announcement, lock associated access controlled exterior doors, and close associated hold-open doors.

1. When the Duress button is pressed a number of events are initiated:
    a. The Fire/Security Panel sends an alarm signal received by the monitoring service which responds to alarm signal following pre-determined protocol which relays call to authorities.
    b. Initiates pre-recorded intercom or PA system announcement
    c. Locks the card reader access controlled doors
    d. Drops power to door hold-opens
    e. Initiates signal to BAS to shut down fans
    f. Bus strobe activated

FUNCTIO -NALITY MATRIX	BUTTON DESCRIPTION	Signals central station to initiate response call to 911	Plays pre-recorded PA announce-ment	Closes electro-magnetic hold-open doors	Locks associated Access controlled doors	Bus Strobe activated	Fans Shut down
LOCK DOWN BUTTON	"Mushroom" button latching pushbutton starts sequence			**X**	**X**		
DURESS BUTTON	“Hold-up” button mounted under desk at right-hand side kneewell, latches on activation and is reset by key	**X**	**X**	**X**	**X**	**X**	**X**

28 16 00 Intrusion Detection

Part 1- General

1.01 Intrusion Alarm Functional Description

A. Provides ability to arm the Intrusion Alarm during times when the building will be unoccupied and disarm the Intrusion Alarm during times when the building will be occupied using a PIN-code keypad Intrusion Alarm arming station and/or card reader.

B. Communicates alarm signals to the commercial central station monitoring service upon activation of any Intrusion Alarm sensors. They in turn respond to alarm signals following pre-determined protocols which may include calling 911.

1. Door alarm contacts provide status monitoring of open or closed position of door and are used to detect “Door Forced” alarms when the door is opened without disarming the Intrusion Alarm.
2. Motion detection sensors detect the passive infrared signature of a person moving within the building while the Intrusion Alarm is armed and initiates an alarm signal.
3. Glass break detectors detect the sound signature of breaking glass and initiates an alarm signal; these may be active at all times – not just when the Intrusion Alarm is armed.
4. Door sensors.
5. Window sensors on ground level window openers.

1.02 Design Criteria

A. In existing schools new alarm contact, motion detectors, door sensors, and glass break sensor devices will utilize existing Intrusion Alarm Panels and auto-dialers.

28 23 00 Video Surveillance

Part 1- General

1.01 Summary

A. A video surveillance system shall be installed to provide live and recorded video images of MSBSD facilities in support of the safety and security of users of the facility in accordance with MSBSD defined standards.

1.02 IP Security Camera and Recording System

A. IP Security Camera and Functional Description

1. Provides live and recorded video images of activity at the facility
2. Provides forensic evidence from recorded video images
3. Provides capability to audit compliance with policies and procedures
4. Provides capability to remotely view activity and history at a facility
5. Provides recorded video images that can be used for Faculty and Staff training

B. Design Criteria

1. The IP Security Camera system shall be installed with the goal of providing

a. Protection of Student, Faculty, and Staff

b. Protection of MSBSD facilities against threats that could potentially shut down the School (preserve continuity of operations)

c. Protection of high-value property and assets

d. Observation and recording of behaviors and actions exhibited in and around the School

2. The IP Security Camera design location should first be installed in areas where Student, Faculty and Staff safety are most likely in jeopardy. These areas may include but are not limited to:

   a. Where pedestrians and traffic cross paths

   b. Where incidents have historically occurred

   c. Where visitors first enter the School through publicly-accessible entry points

   d. Where visitors first interact with Students, Faculty and Staff

   e. Where video images may place individuals at a certain place at a certain time

   f. Where video images may capture identifiable characteristics, clothes, and other features

   g. Where Faculty and Staff enter and exit the School

   h. Where Faculty and Staff arm and disarm the Intrusion Alarm

3. Camera locations should then be specified in areas where the MSBSD facilities are most likely to be in jeopardy. These areas may include but are not limited to:

   a. Where incidents of arson have historically occurred

   b. Where an act of arson might occur, is a likely or easily accessible point, or would produce a great amount of damage

   c. Where window breakage has historically occurred

   d. Where an act of window breakage might occur, is a likely or easily accessible point, or might go unnoticed for a significant amount of time

   e. Where utility equipment, rooms, vaults, network and communications connections are accessible

   f. Shall be installed at card reader access controlled doors covering entry with the intention of being able to identify person(s) entering these locations.

4. The IP Security Camera system should be supported by MSBSD-approved signage indicating the use of video surveillance in the area.

5. The tables on the following pages represent the Design Criteria for camera surveillance criteria, typical camera placement, camera function, and camera priority. Camera priority is classified as follows:

Priority 1—required based upon school type

Priority 2—recommended based upon school type

Priority 3—optional based upon school type

Separate Tables have been created to further clarify the Design Criteria by School Type (Elementary, Middle & High School).

HIGH SCHOOL Camera Criteria		**Camera Placement**	**Camera Function**	**Camera Priority**
1	Where visitors first interact with Students, Faculty and Staff	Interior	Reception Area and immediate corridor(s)	1
2	Where visitors first enter the School through publicly-accessible entry points	Exterior	Viewing Main Entrance(s)	1
3	Where Faculty, Staff and Students enter and exit the School	Exterior	At controlled entry points	1
4	Where incidents have historically occurred	Exterior	Viewing areas of concern	2
5	Where an act of arson might occur, is a likely or easily accessible point, or would produce a great amount of damage	Exterior	Viewing areas of concern such as Loading Dock, Dumpster Area, and major perimeter points.	1
6	Where incidents have historically occurred	Interior	Viewing areas of concern such as stairwells	2
7	Where video images may place individuals at a certain place at a certain time	Interior	Primary Corridor(s), Bathroom Entrances and Locker areas	1
8	Where video images may place individuals at a certain place at a certain time	Interior	Secondary Corridor(s)	2
9	Where pedestrians and traffic cross paths	Exterior	Parent pick-up & drop-off and viewing approaches to facility	2
10	Where video images may capture identifiable characteristics, clothes, and other features	Exterior	Viewing areas of concern such as Parking Lots, portables and assembly areas	2
11	Where video images may capture identifiable characteristics, clothes, and other features	Exterior	Athletic Complexes with artificial turf and adjacent areas	1
12	Where pedestrians and traffic cross paths	Exterior	School bus pick-up & drop-off and viewing approaches to facility	1
13	Where utility equipment rooms, vaults, and other high value assets are accessible	Interior	General viewing of adjacent areas of concern in conjunction with cameras viewing interior corridors	3
14	Where Faculty and Staff arm and disarm the Intrusion Alarm	Interior and/or Exterior	Viewing person entering facility and/or interior view of arming station approach	1
15	Areas that are used by community access groups	Interior and/or Exterior	Areas of concern such as gymnasiums, and sporting fields	3

MIDDLE SCHOOL Camera Criteria		**Camera Placement**	**Camera Function**	**Camera Priority**
1	Where visitors first interact with Students, Faculty and Staff	Interior	Reception Area and immediate corridor(s)	1
2	Where visitors first enter the School through publicly-accessible entry points	Exterior	Viewing Main Entrance(s)	1
3	Where Faculty, Staff and Students enter and exit the School	Exterior	At controlled entry points	1
4	Where incidents have historically occurred	Interior	Viewing areas of concern	2
5	Where an act of arson might occur, is a likely or easily accessible point, or would produce a great amount of damage	Exterior	Viewing areas of concern such as Loading Dock,	1

			Dumpster Area, and major perimeter points.	
6	Where video images may place individuals at a certain place at a certain time	Interior	Viewing areas of concern such as stairwells and restroom entrances	2
7	Where video images may place individuals at a certain place at a certain time	Interior	Primary Corridor(s) and Locker areas	1
8	Where video images may place individuals at a certain place at a certain time	Interior	Secondary Corridor(s)	2
9	Where pedestrians and traffic cross paths	Exterior	Parent pick-up & drop-off and viewing approaches to facility	2
10	Where video images may capture identifiable characteristics, clothes, and other features	Exterior	Viewing areas of concern such as Parking Lots, portables and assembly areas	2
11	Where video images may capture identifiable characteristics, clothes, and other features	Exterior	Athletic Complexes with artificial turf and adjacent areas	1
12	Where pedestrians and traffic cross paths	Exterior	School bus pick-up & drop-off and viewing approaches to facility	1
13	Where utility equipment rooms, vaults, and other high value assets are accessible	Interior	General viewing of adjacent areas of concern in conjunction with cameras viewing interior corridors	3
14	Where Faculty and Staff arm and disarm the Intrusion Alarm	Interior and/or Exterior	Viewing person entering facility and/or interior view of arming station approach	1
15	Areas that are used by community access groups	Interior and/or Exterior	Areas of concern such as gymnasiums, and sporting fields	3

ELEMENTARY SCHOOL Camera Criteria		**Camera Placement**	**Camera Function**	**Camera Priority**
1	Where visitors first interact with Students, Faculty and Staff	Interior	Reception Area and immediate corridor(s)	1
2	Where visitors first enter the School through publicly-accessible entry points	Exterior	Viewing Main Entrance(s)	1
3	Where pedestrians and traffic cross paths	Exterior	Parent pick-up & drop-off and viewing approaches to facility	1
4	Where pedestrians and traffic cross paths	Exterior	School bus pick-up & drop-off and approaches to facility	1
5	Where incidents have historically occurred	Interior/Exterior	Viewing areas of concern	2
6	Where an act of arson might occur, is a likely or easily accessible point, or would produce a great amount of damage	Exterior	Viewing areas of concern such as Loading Dock, Dumpster Area, and major perimeter points.	1
7	Where video images may capture identifiable characteristics, clothes, and other features	Exterior	Play Areas(s), portables and adjacent outside areas	1
8	Where Faculty, Staff and Students enter and exit the School	Exterior	At controlled entry points	2
9	Where pedestrians and traffic cross paths	Secondary Exterior	Parent pick-up & drop-off and viewing approaches to facility	2
10	Where pedestrians and traffic cross paths	Secondary Exterior	School bus pick-up & drop-off and approaches to facility	1
11	Where video images may place individuals at a certain place at a certain time	Interior	Primary Corridor(s)	1
12	Where video images may place individuals at a certain place at a certain time	Interior	Secondary Corridor(s)	2

13	Where utility equipment rooms, vaults, and other high value assets are accessible	Interior	General viewing of adjacent areas of concern in conjunction with cameras viewing interior corridors	3
14	Where Faculty and Staff arm and disarm the Intrusion Alarm	Interior and/or Exterior	Viewing person entering facility and/or interior view of arming station approach	1
15	Areas that are used by community access groups	Interior and/or Exterior	Areas of concern such as gymnasiums, and sporting fields	3

C. General System Information

1. Responsibility for operation and maintenance of the IP Security Camera system shall be shared by MSBSD IT and MSBSD O&M.
2. The goals for the IP Security Camera system to be provided and installed as part of this project include:
    a. Standardize security measures across the MSBSD
    b. Ensure system compatibility and integration
    c. Review use of IR panels in exterior areas where there may not be sufficient lighting to support camera operation in low/no light (such areas may include athletic complexes and areas with high-value property or assets).
3. IP Security Camera surveillance cameras will not be installed in classrooms. In rare cases, dual use areas may be covered by scheduling camera operation times. This will require Superintendent approval on a case-by-case basis in accordance with MSBSD policy.
4. The MSBSD is standardized on CAT-6a and 50 micron multimode (OM3) fiber for network and video cabling.
5. Each School will have its own dedicated Network Video Recorder (NVR) installed locally within the School MDF or IDF Room with approval from MSBSD IT Director or designee.
6. There is no intent for the design to include pan-tilt-zoom (PTZ) cameras.
7. While the installation of cameras does not present a physical barrier to undesirable or unsafe behaviors their very presence may act as a deterrent to the behaviors.
8. IP Security Camera video recordings shall be kept for a period of 30 days in accordance with the existing Mat-Su BP 5143 and AR 5143 “Closed Circuit Television Systems (Surveillance Camera Systems)” policy documents. These documents are written to require on-going configuration of settings such as frame rate, resolution, and motion detection in order to achieve the 30 days’ worth of recordings.
9. Interior camera installations are preferred over exterior camera installations. Where cameras are installed at exterior locations they should be installed on buildings in

lieu of pole-mount. Pole-mount cameras are to be avoided due to the fact that they are difficult to access and expensive to service.

10. Authorized personnel should have the capability to remotely access, view, archive, search, and otherwise perform administrative and management functions on any networked Network Video Recorder (NVR) from a centralized location.

28 30 00 Electronic Detection and Alarm

Part 1- General

1.01 General Comments

A. Fire alarm conduit shall be red except where exposed in classrooms and common areas. Vocation room exposed conduit can remain red. Fire alarm and detection system must have appropriate Fire Marshal approval. Architect may verify specific jurisdiction with Project Manager if necessary.

1.02 Description

A. Initiating Device

1. Smoke detection throughout all paths of egress. This includes smoke detectors in larger rooms or intersecting 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.

2. 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.

3. All doors opening into the corridor system will have door release electro 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.

4. Air handling units shall have photoelectric 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 detectors for building protection during night fan shutdown.

5. Manual pull stations shall be provided at every exit and where required under UBC and NFPA 101, 72. Stopper II vandal resistant covers shall be installed on all pull stations.
6. High temperature heat detectors shall be fixed temperature replacement element type. One hundred thirty five (135) degree heat detectors shall be the intelligent type. Star Sprinkler Corporation or MSBSD approved equal. Do not use rate of rise type.
7. 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.
8. Fire alarm shut down shall function as follows:
    a. Individual control circuit for air handling units shall be zoned through the supplemental relay contacts of the fire alarm control panel.
    b. No high voltage (non-class 2).
9. Provide separate 110 volt outlet at the fire alarm panel.

B. Horn circuits

1. 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.
2. 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
3. Assembly areas and areas larger than a classroom 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.
4. 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.
5. The office will have a strobe unit only, so that the staff can communicate with the fire department on the telephone.
6. At the FA/Security panel specify a lockdown tone different from fire alarm.

7. 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.
8. Exterior horns shall be located so as not to drown out the sound of the sprinkler water gong. Use single horn per building.
9. 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.
10. All J-box covers painted red for identification.
11. Provide program feature to self-reset after power outage.

C. Reserve Capacity

1. Horn circuits shall be limited to maximum 3 ohms loop resistance.
2. Horn circuits shall not draw more the 1 1/8 amp.
3. Initiating circuits shall be limited to half of manufacturer's recommended maximum capacitance and shall not exceed manufacturer's maximum resistance to the furthest point on the cable.
4. Initiating circuits shall be limited to 2/3 of maximum number of devices permitted per circuit.
5. Three spare dry contacts, Form C, shall be located in the panel, one (1) alarm contact, one (1) trouble contact and one (1) supervisory contact. These shall be over and above those used for municipal tie and other functions.
6. Six (6) pair 24 gauge, telephone cable shall be pulled to the fire alarm dialer from the main telephone demarc point.
7. The wiring of the system shall be in metal conduit.
8. The bonding and grounding of the conduit shall meet the requirements of the NEC for a power circuit.
9. 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.
10. 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.
11. 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, and dry system low pressure shall be supervised.

D. Panel Programming

1. The master disks of the panel program shall be under the control of the MSBSD at all times. No modification may be loaded into the panel without notification to and approval from the MSBSD, and providing the MSBSD with the latest version on disk and in print along with an explanation for the changes.
2. The access codes to the software shall belong to the MSBSD.
3. 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:

   a. Horn bypass (disables all audible circuits for testing).

   b. AHU disconnect (disables fan and louver operation).

   c. Door disconnect (prevents door closure during tests).

   d. Elevator bypass (disables elevator recall if any).

   e. Gas shut off disconnects.

   f. 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.

4. In addition to the control functions, two keys shall be programmed to override groups of input devices:

   a. Sprinkler flow switch override.

   b. Kitchen extinguisher (ansul) alarm override.

   These functions allow the alarm system to be fully operational during sprinkler maintenance. Trouble signals are generated and reset of the panel restores these functions to normal.

E. Quality Control

1. 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.
2. No work may proceed until submittals have been approved.
3. Wire and cable shall pass megger tests while still on the spool. Results shall be approved before beginning wiring.
4. When wiring is complete, capacitance and megger readings shall be observed by MSBSD approved personnel and submitted before installing devices.
5. 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.

Part 2- Products

2.01 Electronic Detection Products

A. Fire alarm and detections system requires dedicated phone line with installation access readily available at the Fire Alarm System main panel.

B. Fire alarm and detection system shall be General Electric EST3 system, providing integrated security, life safety and access control.

C. Manual Pull Station must be strictly compatible with EST3 fire alarm panel.

D. Audible and visual alarm signal devices will be installed in every occupied space or room and directly visible to all occupants.

E. Fire extinguishers need to be labeled for location. Either an arrow saying Fire Extinguisher or if in cabinet then cabinet must be labeled or stenciled with “Fire Extinguisher”. Per OSHA regulation fire extinguisher itself is not adequate even though color and mounting criteria satisfies the fire department.

F. MDFs/IDFs will have appropriate fire extinguishers.

Division 31- Earthwork

31 00 00 Earthwork

Part 1- General

1.01 Earthwork Requirements

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, other vegetation and any organic detritus shall be buried on-site. Under special circumstances and approval this requirement may be waived by the MSBSD.

C. Drawings specifications shall require Contractor to mark all major underground utilities with permanent markers. Marker is to name the utility and identify depth of burial at property lines, entry into buildings and at changes in direction. Please mark or survey all stand pipes (clean outs on septic system for easy location).

D. Coordinate all demolition with the Project Manager and review all materials to be salvaged and discuss available options for on-site storage. Note special requirements for disposal of regulated wastes or abandonment of well or tanks. MSBSD requires first right of refusal.

E. Clearly define utility locates as a Contractor responsibility. Akonecall.com, dial 811.

31 10 00 Site Clearing

Part 1- General

1.01 Preparation

A. Protect existing trees and other vegetation to remain against damage.

1. Do not stockpile construction materials or excavated materials within drip line of trees.
2. Avoid foot or vehicular traffic or parking of vehicles within drip line.
3. Provide temporary protection as required.

B. Repair or replace trees and vegetation damaged by construction operations.

1. Repair to be performed by a qualified tree surgeon.
2. Remove trees which cannot be restored to full-growth status.
3. Replace with new trees of minimum 4 IN caliper measured 6” above ground.

C. Owner will obtain authority for removal and alteration work on adjoining property.

1.02 Site Clearing

A. Topsoil Removal

1. Strip topsoil to depths encountered.

   a. Remove heavy growths of grass before stripping.

   b. Stop topsoil stripping sufficient distance from such trees to prevent damage to main root system (minimum by dripline).

   c. Separate from underlying subsoil or objectionable material.

2. Stockpile topsoil where directed by Engineer.

   a. Construct storage piles to freely drain surface water.

   b. Seed or cover storage piles to prevent erosion.

3. Do not strip topsoil in wooded areas where no change in grade occurs.

4. Borrow topsoil: Free of subsoil, objects over 2 IN DIA, weeds and roots.

B. Clearing and Grubbing:

1. Clear from within limits of construction all trees not marked to remain.

   a. Include shrubs, brush, downed timber, rotten wood, heavy growth of grass and weeds, vines, rubbish, structures and debris.

2. Grub (remove) from within limits of construction all stumps, roots, root mats, logs and debris encountered.

   a. Totally grub and strip topsoil and subsoil under areas to be paved.

   b. Grubbing in lawn areas

      1. In cut areas, totally grub.
      2. In fill areas, where fill is less than 3 FT totally grub ground.
      3. Where fill is 3 FT or more in depth, stumps may be left no higher than 6 IN above existing ground surface.

3. Note trees with nests of migratory birds and cut them down.

Division 32- Exterior Improvements

32 00 00 Exterior Improvements

Part 1- General

1.01 Landscaping

A. Any landscaping gravel placed around the perimeter of the building must not be larger than D-1 gravel or less than 6” rock.

32 10 00 Bases, Ballasts, and Paving

Part 1- General

1.01 Paving Requirements

A. All exterior play slabs, walks, ramps and etc. that receive asphalt paving or concrete shall be placed on Non Frost Susceptible (NFS) material. Extend NFS material a minimum 12 inches beyond edge of slab at bottom of excavation.

B. Minimize all concrete curbs. Raised curbs are not conducive to snow removal. If curbs are required, utilize low profile rolled curbs except at the edge of a sidewalk. Utilize raised curbs on proposed walkways. Do not allow medians or islands in parking areas unless absolutely essential for traffic control/guidance.

C. Asphalt curbs are not permitted.

D. Review use of speed bumps or other traffic speed control devices with MSBSD before specifying in documents. No speed dips allowed.

E. Provide a concrete pad of an appropriate size for dumpsters. Match MSBSD Standard 33 CY model. Dumpster space should include enough room for a loading dock catwalk extending at least ¾ the length of the dumpster.

F. Approach shall have no more than 2% slope.

G. All walks, steps and entrances shall slope to drain.

H. All concrete walks, steps and entrances shall have a deep slip resistant broom finish.

I. All walkways at entrances and drop-offs shall be a minimum eight (8) feet wide. Other walkway widths shall be reviewed and approved by MSBSD.

J. Provide curb cuts to achieve an accessible route in conformance with "preferred" options in ADA guidelines. Locate ADA parking on school entrance side of parking lot. Number of spaces as per applicable codes.

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

1.02 Parking Lot Areas

A. MSBSD requires three distinct drop off areas designed and constructed at all schools. These three areas provide for separation of buses, student drop off and general parking for the safety of the students.

   1. Bus drop off and pick up area
   2. Student drop off area
   3. General parking

B. Bus parking will be separate giving enough area to allow for the arrival, parking and departure with separate entrance from other areas. Student should exit the bus towards the entrance of the school and not have to cross in front of moving traffic. This separated bus area is to eliminate mixing of buses and other vehicles from competing for right of way.

C. Student drop off will provide a one way entrance/exit by the front door for parents to drop students and have a visual of student access to the school. This driveway should not allow for vehicles to pass or drop students off other than a sidewalk or designated area. Students should not be crossing traffic flow while walking to the school. No drop off lanes wider than a lane and a half total.

D. Teachers and public should have a parking area that allows for parents/students to safely walk from the parking to the school with marked paths with minimal walking in traffic flow. Parking should have its own entrance/exit with clearly signed areas. ADA parking should be available without having to traverse through the parking lot.

E. All areas should have proper ADA access, signage and be sloped appropriately. Lighting should be separated for all three parking areas and be controlled through a DDC system.

32 18 00 Athletic and Recreational Surfacing

Part 1- General

1.01 Artificial Turfs

A. When providing artificial turf it shall meet conditions and character comparable to FieldTurf Tarkett or MSBSD approved equal within budget constraints.

B. Fieldturf Fill

   1. On prepared subgrade place and compact Base Stone, Finishing Stone and other appurtenances to final elevation as specified on the Plans.
   2. Base Stone
      a. Base stone must be laid without damaging or disturbing the soil bed, geotextile liner or membrane, or the underlying flat composite drains. It is very important not to create any depressions in the sub-grade with heavy equipment. The specified stone or aggregate supplied must conform to the specifications, as noted above.

The stone shall be damp when transported to site and shall be kept damp during installation, to minimize segregation of the materials.

b. If the required compacted depth of the Base Stone exceeds six inches (6”), the Base Stone shall be constructed in two (2) or more layers or lifts of approximate equal thickness that shall not exceed twelve inches (12”) in loose thickness. Each layer must be compacted in both directions to attain the specified compaction.

c. The Base Stone shall be sloped a minimum of one-half percent (0.5%) from the center longitudinal axis towards the sidelines or as specified on the Plans.

d. The grade of the Base Stone shall not vary from the specified grade by more than one-half inch (1/2”) from design grade.

e. The Base Stone shall be compacted in both directions to ninety-five percent (95%) of the maximum density.

3. Finishing Stone

a. Finishing Stone final lift layer shall not be more than two inches (2”) deep.

b. The Finishing Stone final lift material shall be sloped a minimum of one-half percent (0.5%) from the center longitudinal axis towards the sidelines or as specified on the Plans.

c. The final grade must be compacted in both directions to ninety-five percent (95%) of the maximum density.

d. The final grade of the Finishing Stone shall not vary from the specified grade by more than one-quarter inch (1/4”) from design grade, nor by more than one-quarter inch (1/4”) when measured under a ten foot (10’) straightedge, in all directions. Laser guided fine grading is mandatory. This tolerance is required over the entire field to receive turf. Check the tolerance-to-grade by means of an orbital laser once the stone is fine grades and compacted to proper density. The turf installation company shall not commence work until the base has been tested for compaction, tolerance to grade, and porosity.

C. Equipment

1. Provide one set of equipment for each new field

2. A drag style sweeper to remove debris from the field surface. The field sweeper shall be the FieldTurf SweepRight as manufactured by FieldTurf Tarkett, or approved equal.

3. A drag style groomer for raking, brushing, and aerating the field. The groomer shall be the FieldTurf GroomRight with extension wings as manufactured by FieldTurf Tarkett, or approved equal.

4. A field maintenance vehicle for towing the above equipment. This vehicle will be a John Deer Gator TH 6x4. The vehicle shall come with the following factory-provided equipment.
    a. Hi-flotation, turf tires.
    b. 19 hp gas, air-cooled, 2-cylinder, 4-cycle engine
    c. 16.4 cubic foot cargo box with bedliner, tailgate, and drop down sides for flatbed conversion. Include cargo box power lift kit.
    d. 1,400 pound minimum towing capacity with a 1.25 inch rear receiving hitch.
    e. Front protection package with front bumper/brush guard, rubber floor mats, and front fender guard.
    f. Rear protection packaged with rear bumper and cargo box bed mat.
    g. Worksite package with brake and tail light kit, horn kit, cargo box bed mat, and backup alarm.
    h. Deluxe signal light kit.
    i. 1 year power train warranty.
5. Equipment shall be approved by the Artificial Turf Surface Manufacturer for maintenance of the installed field.

D. Manufacturer shall be FieldTurf by Tarkett Sports Company or MSBSD approved equal.

1.02 Synthetic Track

A. When providing a running track for High School facilities specify a rubber surfaced eight lane track. The synthetic track surface shall meet conditions and characteristics specified by the MSBSD and be MSBSD approved.

1.03 Outdoor Fields

A. All schools must have a level playing field, minimum 60 yd x 100 yd and not over 2% slope, with a crown to drain outward to sidelines.

32 30 00 Site Improvements

Part 1- General

1.01 Summary

A. Drawings to indicate locations and types of required traffic signs as needed in the design of the project.

B. Fire Lane Requirements are to be met through Fire Marshal review and approval.

C. Confirm specification of bike racks, flag pole and all site related accessories in written specifications as well as notes on drawings off sidewalks and parks areas. Provide clear indication of location, orientation, height, depth, color and number as appropriate.

32 31 00 Fences and Gates

Part 1- General

1.01 Requirements

A. A chain link fence shall be installed around the improved portion of the school site or school site boundaries.

1. Two-inch / 9-gauge minimum for all perimeter fencing, playground fencing, track and football field fencing.
2. Fence fabric shall be “knuckle-knuckle”, barbs up or down is not allowed.
3. Gate tie-backs, hold-opens, with chain lanyard at least 1.5 feet long with 5/16 gauge links. Pipe sleeves and padlock caps are not allowed.
4. Post-galvanized, schedule 40 pipe. Top Rail-galvanized, 1 5/8” schedule 40 pipe.

B. Coordinate height and configuration of fences with the MSBSD to achieve desired control. Typical fence height to be 6-feet above grade with 2” ground clearance.

C. Specify lightweight, swing type gates adequate in size and located in appropriate areas to allow for snow and equipment removal. Vehicle gates shall be of heavy pipe frame construction. If using pipe sockets in ground for pivots, use freeze proof detailing.

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

E. Asphalt at all fence pedestrian breaks.

1.02 Definitions

A. Plan Requirements

1. Defines perimeter of School property
2. Delineates the transition from public to private property
3. Provides physical barrier around play areas and sports fields to keep students within appropriate areas
4. Provide ADA access according to ADA standards.
5. Provides physical barrier around play areas and sports fields to restrict access to unauthorized visitors, motorized vehicles and animals
6. Funnels vehicular and pedestrian traffic to designated entries/exits

B. Design Criteria

1. Fence fabric shall be standard 6-foot high chain link “cyclone fence”.
2. Where Schools share the same site or share a common property line there will be instances where fencing need only be provided under one scope of work to satisfy the fencing needs of both Schools.

32 31 13 Recreational Court Fences and Gates

Part 1- General

1.01 Summary

A. Do not interrupt utilities serving facilities unless given written permission by the MSBSD.

B. The product of only one manufacturer will be accepted, except for items which do not influence the appearance of completed fence.

C. Accurately form all parts to dimensions.

Part 2- Products

2.01 Gate Parts

A. All steel and iron parts shall be zinc coated after fabrication, using zinc grade “E” in accordance with Federal Specifications.

B. Caps will be cast steel or malleable iron, galvanized; sized to post dimension, set screw retained.

C. Fittings shall be steel.

D. Tension wire will be 7 gage thick steel, single strand.

E. Framework, posts, rails and braces shall comply with ASTM A120 and be Schedule 40 steel pipe, standard weight, and one piece without joints. Lightweight tubing is not acceptable.

1. Post braces shall be provided for each corner, gate, pull, and end post with fabric five feet (5’) or more in height.

    a. The post brace shall consist of a round tubular brace extending to each adjacent post at mid-height of the fabric, and a truss consisting of a rod not less than three-eighths inch (3/8”) in nominal diameter from the adjacent post back to the gate, corner pull, or end post, with a turnbuckle or other equivalent provision for adjustment.

2. Top Rails shall be round (tubular) and in length of not less than eighteen feet (18’).

    a. Top rails shall be fitted with couplings for connecting the lengths into a continuous run. The coupling shall not be less than six inches (6”) long and should provide a substantial connection and shall allow for expansion and contraction of the rail.

    b. Suitable ties or clips shall be provided in sufficient number for attaching the fabric securely to the top rail.

    c. Means shall be provided for attaching the top rail to each gate, corner, pull, and end post.

F. Fittings and Materials

1. Mill-finished aluminum or galvanized iron or steel to suit manufacturer's standards.
2. Unless specified otherwise, hot-dip galvanized pressed steel or cast-iron fence fittings and accessories with at least 1.2 oz. zinc per sq. ft. as determined by ASTM A90.
3. Aluminum shall be die cast conforming to ASTM B26, aluminum-alloy 360 or sand cast conforming to ASTM B85, aluminum-alloy 365, ZGC1A, or Tenzaloy.

Part 3- Execution

3.01 Fence Construction

A. Posts shall be set in augured holes lined with minimum three wraps or 6-mil polyethylene sheet and filled with concrete, or as shown on plans.
   1. Concrete footing shall be a minimum of eight inches (8") in diameter and three feet (3') deep.
   2. The footings shall be allowed to cure for a period of at least seven (7) days before attaching fabric.
   3. Alternately, line posts (only) may be driven to minimum embedment of 60 inches. All gate, corner and pull posts shall be in concrete.

B. Placement
   1. Posts shall be set vertical and of uniform and equal heights above ground with a maximum horizontal spacing of ten (10) feet center to center.
   2. On straight runs, pull posts shall be provided at intervals not to exceed five hundred (500) lineal feet.
   3. Changes in line of thirty degrees (30) or more shall be considered corner posts.
   4. The posts shall be set at grade breaks as required to allow fabric to be attached without creating a gap greater than 4 inches (4") or less than 2 inches (2") between fabric and grade.

C. Fabric
   1. Fabric shall be stretched taut and securely fastened to each end and corner post.
   2. Top edge of fabric shall be fastened to the top rail and the lower edge of fabric shall be fastened to bottom tension wire.
   3. Fabric shall be attached to posts in an even and uniform manner to follow the grade of the land.
   4. Fabric shall be fastened to fence frame at the following intervals:
      a. Posts- 15 inches maximum on center.
      b. Top Rail- 24 inches maximum on center.
      c. Tension Wire- 24 inches maximum on center.

5. All fabric tie wire ends will be parallel with fabric surface to minimize potential injury.

D. Top Rail

1. Top rails shall pass through the ornamental tops of the line posts, forming a continuous brace from end to end of each stretch of fence.
2. Join lengths of tubular top rail by sleeve couplings.
3. Secure top rails fastened to terminal posts by pressed steel fittings or other appropriate means.

E. Tension Wire

1. Provide one continuous length of tension wire between pull posts.
2. Apply sufficient tension to avoid excess sag between the posts.
3. Tie or otherwise fasten tension wires to end, gate, corner, or pull posts by methods approved by the MSBSD.

F. General Appearance

1. All runs of fence shall present the same appearance.
2. No used, re-rolled, or open seam steel will be permitted in posts, rails, or braces.

32 90 00 Planting

Part 1- General

1.01 General Requirements

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

B. Landscape maintenance is the Contractor's responsibility until the facility is returned to the MSBSD upon Substantial Completion. MSBSD requires a two-year warranty period until ground stable on all plantings.

C. The Architect shall check with MSBSD prior to specifying method of seed placement to determine the areas to be maintained to ensure proper placement of application.

Part 2- Products

2.01 Allowed Plants

A. Trees

1. Evergreen Trees

a. Native Alaskan White Spruce/Picea Glauca

b. Colorado Green Spruce/Picea Pungens

2. Deciduous Trees
    a. Native Paper Birch/Betula Papyrifera
    b. Mountain Ash (No berry species)
    c. Swedish Columnar Aspen/Poplus Tremuliodes Erecta

B. Shrubs
1. Hedge Cotoneaster/Cotoneaster Lucidus
2. Goldfinger Potentilla/Potentilla Fruticosa Goldfinger
3. Miss Kim Lilac/Syringa Patula
4. Alpine Currant/Ribes Alpinum
5. Amur Maple/Acer Ginnala
6. Native Goatsbeard/Alaska Aruncus
7. Yellow Flower/Forsythia Meadowlark
8. Rose Tree of China/Prunus Triloba
9. Spiraea/Japonica Alpina
10. Goldflame Spiraea/Spiraea x Bulmada

C. Perennials
1. Little Rocket Rayflower/Ligularia stenochephala—only on shady side or wet soils
2. Alaska Wild Iris/Setosa
3. Yellow Day Lily/ Stella D'Oro Yellow

D. Ferns
1. Ostrich Fern/Matteuccia sturthiopteris
2. Lady Fern/Athyrium filix femina

E. Grass
1. Mowed- Alaska Lawn Mix
2. No Mow- Bromegrass or Perennial Ryes

Division 33- Utilities

33 05 00 Common Work Results For Utilities

Part 1- General

1.01 Building Utility Service Locations

A. Information regarding the location, size and elevations of existing utilities and service points will be furnished by MSBSD Facilities Maintenance Department and confirmed in the field by the Mechanical Engineer if necessary.

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

Part 2- Execution

2.01 Backfill

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, sub drainage, damp proofing, waterproofing, geotextile and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

2.02 Utility Trench Backfill

A. Place backfill on subgrades free of mud, frost, snow, or ice. Under no circumstances will any utility be constructed over frozen material, organic matter or other unstable or unsuitable materials.

B. All buried utility lines are to be laid in compacted bedding material with proper grade and surrounded with a minimum of 6 inches of sand.

C. Bedding is to be uniformly placed the full extent of the ditch and completely cover the piping or conduit a minimum of size inches (6”) above and below the piping or conduit and one foot (1’) to each side of the piping or conduit.

D. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

E. Backfill trenches excavated under footings and within eighteen inches (18”) of bottom of footings with Class A subbase fill.

F. Backfill voids with satisfactory soil while removing shoring and bracing.

G. Place and compact initial backfill of bedding course, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.

1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

H. Place and compact final backfill of satisfactory soil to final subgrade elevation.

I. Placement and compaction of backfill shall not disturb, move, or affect the piping or conduit.

J. Install detectable warning tape directly above utilities, 3 feet below finished grade, except 2 feet below finished grade under pavements and slabs-on-grade. Warning tape shall be installed above and parallel to axis of the utility with no breaks in continuity.

2.03 Soil Fill

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use selected material.

2. Under walks and pavements, use subbase and leveling course.

3. Under steps and ramps, use subbase and leveling course.

4. Under building slabs, footings and foundations, use subbase and leveling course.

C. Place soil fill on subgrades free of mud, frost, snow or ice.

2.04 Soil Moisture Control

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.

2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by two percent (2%) is too wet to compact to specified dry unit weight.

2.05 Compaction of Soil Backfills and Fills

A. Place backfill and fill soil materials in layers not more than 12 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the fill length of each structure.

C. Compact soil materials to not less than the following percentage of maximum dry unit weight according to ASTM D 1557:

1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.

2. Under walkways and Artificial Turf, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 95%.

3. Under Natural Turf or unpaved areas, scarify and recompact top six inches (6”) below subgrade and compact each layer of backfill or fill soil material at ninety percent (90%).

4. For utility trenches, compact each layer of initial and final backfill soil material at 95%.

33 10 00 Water Utilities

Part 1- Products

1.01 Materials

A. Pipe, fittings and appurtenances shall be shall be lead-free and certified for use in potable water systems per the current version of ANSI/NSF Standard 61.

B. All water distribution piping in this project must be installed with restrained joints. Joints, fittings, valves and piping deflection points must utilize a thrust restraint system.

1.02 Ductile-Iron Pipe and Fittings

A. Ductile-Iron Pipe (DIP)

1. Pipe and fittings for potable water service shall be evaluated, tested and certified for conformance with NSF Standard 61 (NSF 61).

2. Ductile Iron Pipe must conform to the requirements of AWWA C151, with cement mortar lining conforming to the requirements of AWWA C104/ANSI A24.1.

3. Class 52 pipe shall be used for all Ductile-Iron Pipe unless otherwise specified.

4. All Ductile-Iron Pipe shall be restrained. Tie back rods and/or tie back rod and shackle assemblies, along with thrust blocks will not be acceptable thrust restraining system for valves, fittings, piping deflection points, and inside casing.

5. All Ductile-Iron Pipe cement-mortar lining shall be given a seal coat in conformance with AWWA C104.

6. Ductile-Iron Pipe fittings shall be a minimum of 250 pounds pressure rating, mechanical joint or all bell, lined or unlined, either cast iron or ductile iron, unless otherwise required by the Contract Documents.
7. All Ductile-Iron Pipe fittings shall conform to the requirements of AWWA C110/ANSI A21.10 or C153 A21.53-06.
8. Fittings, except for the bell protection devices, are to have exterior and interior surfaces coated with fusion bonded epoxy in accordance with AWWA C116/A21.13-09.
9. Glands, Gaskets, and Bolts: Rubber gasket joints for Ductile-Iron Pipe and fittings shall conform to the requirements of AWWA C111/ANSI A21.11. Nuts and bolts shall be Type 316 stainless steel with a minimum tensile strength of 75,000 PSI and shall conform to ASTM F593 and F594. All bolts shall be stamped with the grade marking on the head of the bolt, and shall be T-316, 316, or F593.
10. Acceptable Manufacturers: Subject to compliance with requirements of this Section and Contract Documents acceptable manufacturers include the following:

    a. U.S. Pipe.

    b. Pacific States Cast Iron Pipe Company.

    c. Or approved equal.

33 20 00 Wells

Part 1- General

1.01 Well Requirements

A. Contractor must obtain all permits to construct, including the following:
   1. Approval to Construct
   2. Interim approval to operate
   3. Final approval to operate by the ADEC

B. Wells must be operated by a certified water operator for each system.

33 36 00 Utility Septic Tanks

Part 1- General

1.01 Requirements

A. Allow no equipment walkways, pavement, or play areas within 15’ of septic tank or septic field.

Part 2- Products

2.01 Steel Septic Tank

A. Two-chamber concrete tank preferred or two-chamber, cylindrical 10 gauge steel tank.

B. Interior/exterior coating: 10 mils corrosion inhibiting polyurethane lining

2.02 Insulated Risers and Lids:

A. Risers shall be required for access to internal vaults and access into the septic tanks for septage pumping. All standpipes and risers on tank (and all compartments) must be above ground for access and pumping.

B. All risers and their connection to the septic tank shall be constructed watertight.

C. Risers shall extend 3" above original grade to allow for settlement and to ensure positive drainage away from the access.

D. Risers providing access to pump vaults shall be a minimum of 24 inches in diameter and shall have a minimum of 4 inches of polyurethane spray-applied insulation with shop applied, water resistant coating on the top exterior 4 feet of the riser.

E. One lid shall be furnished steel with each access riser.

F. Lids shall be fiberglass with non-skid finish, and provided with stainless steel bolts, and wrench.

G. Lid shall be shop insulated to ensure a proper fit.

H. Pump out riser to primary tank chamber shall be PVC/ABS with rubber cap and pipe clamp, Jim Cap or approved equal. Pump out riser is not insulated.

2.03 Tank Backfill and Bedding Material

A. Compacted to a minimum 95% density.

B. Backfill of tank must be brought up in 1' lifts and compacted or sand inlayed with vibration damping technique backfill.

C. Tank, piping, and risers/vaults must be insulated to a minimum 4' ground cover equivalent.

2.04 Underground Warning Tape

A. Vinyl foil back tape.

B. Size

1. 6 IN wide (minimum).

2. Thickness: 5 mils.

C. Fabrication

1. Legend: Preprinted and permanently imbedded.

2. Message continuous printed.

3. Tensile strength: 1750 psi.

D. Green with black letters.

E. Letter height shall be 1-1/4 IN minimum.

F. Legend

1. First line: “CAUTION CAUTION CAUTION”
2. Second line: “BURIED SEWER LINE BELOW”

Part 3- Execution

3.01 General

A. All pipe shall be installed in strict accordance with manufacturer's recommendations, drawings and/or specifications and in the best commercial trade practice. Remove scale and dirt on inside and outside of pipe ends before assembly.

B. Pipe and Fittings: Size as indicated on the plans. Install as shown in accordance with manufacturer’s recommendations.

C. During loading, transportation and unloading, every precaution shall be taken to prevent injury to the pipe. No pipe shall be dropped from cars

3.02 Examination

A. Examine areas and conditions for compliance with requirements and other conditions affecting performance of septic tank systems.

B. Verify compatibility with and suitability of soil structure and materials.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.03 Earthwork

A. Stockpile topsoil for reuse in finish grading without intermixing with other excavated material. Stockpile materials away from edge of excavation and do not store within drip line of remaining trees.

B. Excavate sufficient width and length for tank to depth determined by tank inlet elevation. Provide level bottom for placement of tank or basin.

C. Backfill with material as shown on the Drawings.

D. Strip and stockpile topsoil

E. Excavate and install drainfield to dimensions and elevations indicated on the Drawings.

F. Install perforated discharge piping level within a drain rock channel.

G. Provide monitor wells and cleanouts as shown on the drawings.

3.04 Protection of Existing Utilities

A. Contractor to verify the location of all underground utilities. Omission from, or the inclusion of utility locations on the plans is not to be considered as the nonexistence of or a definite location of existing underground utilities.

33 40 00 Storm Drainage Utilities

Part 1- General

1.01 Storm Drain Requirements

A. Furnish an overall site drainage plan for review and approval of the MSBSD.

B. Contract documents shall identify areas to be utilized for stockpile of snow. Provisions must be made to allow for drainage of these areas.

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

D. Provide (1 ½%) to (2 ½%) slopes in all parking lots, drive and loading docks.

E. Do not interfere with natural drainage of adjacent properties.

F. Asphalt play areas shall be well drained, generally with a 1 ½ % minimum slope.

G. If dry wells are used, verify and obtain Alaska Department of Environmental Conservation (ADEC) approval. Dry wells are to be provided with fully insulated and heat taped waste lines.

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FACILITY DESIGN CRITERIA MANUAL

NOTE TO THE USER:

Over the years, District personnel have gained a store of valuable experience and data relating to building design and function. The intent of this manual is to compile the experience and information of school district personnel to define desirable and undesirable design features proven over the years. It is not presumed that this be complete or authoritative. Items will be added and changed as time goes by.

We have attempted to address function as it relates to physical use, maintenance and operation of the facility. The evaluations are subjective and specific life cycle costs have not been determined.

The manual focuses primarily on school facilities, but is flexible enough to include other construction. We have attempted to avoid tunnel vision and not restrict creativity. We certainly do not claim to have a corner on any design features or ideas and welcome your additions, comments and experience in an effort continually to improve this manual. The manual is easily updated and should be periodically reviewed.

Both prescriptive specs (specified items or brand) and performance specs (Quality of end result or feature) have been used, however, we have attempted to use performance specifications as much as possible.

We have attempted not to be nit picky but include items that have a significant importance to the cost and function of the product. We would appreciate your careful review of this manual with the hope that all of us will benefit from our collective previous experience and not reinvent wheels or recreate headaches.

Designers must specify the best, expect the best, and inspect the best if we are to receive the best. In other words, clearly define the work, expect the performance and properly inspect the product.

Conditions and products are forever changing; therefore, this manual is designed to be continually updated otherwise it will quickly and surely lose its value.

The criteria on the following pages are organized according to the Construction Specifications Institute (CSI) 16 Division Format for Construction Specifications. Each division is a separate unit and is subdivided into broad scope sections titles. Additional broad scope or narrow scope section titles may be added as necessary.

Review and enclose as part of specifications the latest LKSD boilerplate for general conditions. The District must approve any modifications. Include copy with Design Criteria.

00010 DESIGN DELIVERABLES

Concept Design:

a) Preliminary record survey with property lines and topography.
b) Site plan(s) showing the placement of the building footprint, roads and drives for circulation/parking of applicable vehicles, pedestrian development, general drainage and utility services.
c) Floor plan(s) showing the organization, sizes and arrangement of spaces required along with concepts for window, door, and security gate placement.
d) Elevation(s), at least one per scheme showing a primary view with general building features (elevations do not need to show future expansions).
e) A space allocation comparison of the conceptual design(s) with the tabulation in the ed spec.
f) Brief conceptual design statements from the civil, structural, mechanical and electrical disciplines stating the general design intent and key determinations.

Schematic Design:

00020 BUILDING CONFIGURATION

Standard Classroom Sizes (net SF):

a)	*Kindergarten*	*900sf*
b)	*Grades 1-3*	*850sf*
c)	*Grades 4-6*	*800sf*
d)	*Grades 7-12*	*750sf*

Standard Corridor Widths:

a)	*Grades K-6*	*7'-6" clear (note: add 6" for corridors with lockers)*
b)	*Grades 7-12*	*8'-6" clear (note: add 12" for corridors with lockers)*

Standard Classroom Configuration:

Focal wall: *Provide a 12' white board with tray on this wall and two 4' tack boards. The white board should be specified with a continuous map rail, and moveable clips/hooks. Provisions to mount Smart Boards centered on this wall are needed as is adequate lighting of the white board area. A 6' pull down projection screen should also be incorporated. Controls for the in-room media distribution described in the Technology section should be mounted on this wall. The relation of the entry door to the classroom and this teaching wall vary among those in the teaching profession. Most prefer the door not be adjacent to the focal wall. Check with the local staff during design to confirm.*
Window wall: *Provide one or more windows with a total area between 30sf and 90sf. An operable section no smaller than that required by code for a residential sleeping room should be provided. Make provisions to accommodate heat registers at this wall. Consider provisions for table-height (30") furnishings when planning sill heights and electrical raceway configurations at this wall.*

Secondary Wall: *Provide an 8' smart board and two 4' tack boards on this wall. This wall often provides support to the classroom's wired technology. Adequate power and data are needed.*
Storage Wall: *Near the teaching station of the focal wall provide for wardrobe cabinet or closet for teacher storage of coats, footwear and teacher valuables. Provide a full-length mirror on the inside of the wardrobe door. Adjacent to the wardrobe closet, provide space for a legal 4-drawer filing cabinet. Elsewhere, at floor level provide continuous counters with base cabinets. Within this base cabinet provide a set of open shelves suitable for storing posters, maps and supplies up to 24"x 30". At classrooms serving K-6 students, substitute a portion of the base cabinets with storage for the personal gear (i.e., boots/shoes, coats, hats and backpacks) of up to 20 students. Also at K-6 classrooms, provide a small stainless steel sink and faucet equipped with a "bubbler" type drinking fountain. Continuous along this wall, where possible, install upper cabinets to 9 feet.*

01010 SUMMARY OF WORK

Clearly define project and work limits.

Provide schedule of owner-furnished equipment. Provide for coordination of owner-furnished-contractor-installed items. Define requirements for blocking, inserts, templates, etc., identify storage and staging of equipment furnished by LKSD.

Identify construction schedule for completion of spaces, fire alarm systems, sprinkler systems, etc. and requirements for partial occupancy.

Design/Build contractor shall review project with and obtain approval from state and local agencies such as, State Fire Marshal *(plan review),* Department of Environmental Conservation *(food service), Department of Transportation (driveway permits), local building departments (development & building permits),* fire department *(plan review), local utilities (utility permits),* etc. (See EED Grant Application List, APPENDIX D, Page 2) Review list with Owner during preliminary phase. Design/Build contractor shall pay all permit fees and associated costs.

01150 MEASUREMENT AND PAYMENT

Make judicious use of unit prices. Suggest for over-excavation and backfill. Quantities to be determined by cross sectional analysis.

Proposed fees are required, including home & office overhead, on a percentage bases that will be applied to change orders during construction.

01200 PROJECT MEETINGS

Preconstruction meeting is required that includes general contractor, representatives of the mechanical, electrical and other major subcontractors. Review all materials that might require long lead times, schedule, communications, chain of command, etc.

Hold weekly job site meetings. In addition, hold management overview meetings attended by the contractor's project manager, the District's Project Manager, and other LKSD personnel as

appropriate. Add architect and engineer personnel via phone if unavailable in- person. Meeting location shall be at the site, at LKSD offices in Bethel, or in Anchorage, as determined by the LKSD.

01300 SUBMITTALS

No substitute shall be ordered or installed without the written approval of the District's Consultants and the Designated Representative (Project Manager), who shall be the judge of quality and who may require the Contractor to furnish any data about the proposed substitute which the Project Manager considers pertinent. The Owner shall be informed, by the Project Manager's approval, and the Owner shall give the final approval of any proposed material, equipment or detail to the Project Manager for transmittal to the Contractor. The Owner may require the Contractor to provide performance guarantees and bonds for the proposed substitute in the form the Owner deems necessary.

Owner shall review all submittals. LKSD must be informed of ALL changes made in submittals.

Owner must REVIEW all changes in furnishings. No ACBM allowed unless approved by LKSD.

01400 QUALITY CONTROL

Owner will pay for and provide construction testing. Contractor shall coordinate with Owner for testing schedules. Contractor shall pay for all failed tests, expenses, and re-inspection.

01500 TEMPORARY FACILITIES AND CONTROLS

All projects shall require a project sign. Review content and location with LKSD. Contractor coordinates with LKSD/Electric Utility for temporary power.

For additions to existing buildings, LKSD will supply contractor with power if existing service is sufficient.

Temporary heating will be by contractor. Except in remodel the contractor is to pay difference in historic usage. No electric temporary heat unless reviewed and approved by LKSD.

Telephone: LKSD will initiate order for permanent phone for new buildings only. The contractor is to provide phone for construction. General contract is to include conduits and pull-strings.

Temporary Water: by contractor, unless reviewed and approved by LKSD.

Temporary Sewer: by contractor, unless reviewed and approved by LKSD.

Construction Barriers: Review with LKSD, and school principals, specify types of barriers and provide details for construction if required.

Security: Contractor will be responsible. Master keys will be provided by Maintenance as required. All master keys must be returned at end of Project or GC shall pay to re-key all locks associated with master key.

Noise Control: Contractor coordinates with Owner.

Dust Control: Essential where adjacent to existing facility. Specify methods and materials to be used.

All temporary connections shall be made in an approved manner, meeting all applicable codes. Caution should be taken so systems are not overloaded. During normal school hours the school shall have priority use of these facilities. The contractor shall take special precautions to keep his temporary connections and lines from being damaged. Temporary connections shall be disconnected and removed prior to completion of the project and returned to original conditions.

01600 MATERIAL AND EQUIPMENT

Changes made after the project is bid and awarded should be avoided. We have had a problem with unacceptable changes made at the submittal stage. Also include in boiler plate a form for request for substitution.

01700 PROJECT CLOSEOUT

Contractor shall submit to LKSD: mylars and four blueprints of record drawings by his designer. Also submit CADD disk in AutoCAD format. Show actual location of major conduit runs, piping and underground utilities. Stipulate a line item in Schedule of Values specifically for As-Builts that are approved by Owner and A/E.

A thorough operations and maintenance manual shall be submitted. Owner requires five (5) copies for maintenance, and an electronic copy on CD.

A thorough hands-on demonstration of all systems shall be made with general contractor, mechanical, electrical, and other required subs, architect and engineering personnel and LKSD personnel. This is expected to take more than two days, and must be scheduled two weeks in advance. Specify training requirements within each specification section, and provide a summary of training requirements within project closeout section to assure that all necessary training is identified. All alarms and all mechanical systems shall be run completely through all phases. Actual fire test of fire alarms should be scheduled separately and in advance of other testing and walkthrough. All training shall be videotaped and recorded on DVD. DVD shall be turned over to owner within 14 days of completion of training.

Spare parts and maintenance materials: List all spare parts that should be maintained on hand, and give names and addresses of replacement suppliers, provide complete list within project closeout section and see that copy is transmitted to Owner at substantial completion.

Special cleaning and care instructions for all finish materials must be provided verbally and in writing to the custodial staff. Identify any special equipment requirements for maintenance manual for non-mechanical/electrical items.

02010 SUBSURFACE EXPLORATION

Include soils information when available and include in drawings or specifications. Notify Contractor that the information is for his use only and may not be used for bidding purposes. Soils reports by their nature are generalizations and actual conditions may vary from those indicated by the report.

02110 DEMOLITION

Coordinate all demolition with LKSD. Give LKSD salvage rights to all materials, equipment, etc. Review the LKSD materials that are to be salvaged and where they are to be stored. Require contractor to salvage and turn over to LKSD in good condition any existing equipment not reused in completed project (i.e., generator, furnaces, kitchen equipment, fire alarm system components.

02160 STEEL PILES

Thermistors shall be Beaded Stream

02200 EARTHWORK

State whether on-site materials may be used and any limitations.

Location of disposal area for demolition or clearing, if allowed on site, shall be shown on drawings. Types of materials suitable for disposal on site must be identified. Areas of future expansion and site development should be avoided as disposal sites. Locations shall be properly incorporated into the record drawings.

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.

Concrete slabs adjoining building at doorways shall be constructed on moisture proofed footers and foundations walls, to prevent frost heave and settlement.

02461 TIMBER PILING

Wrap all wooden piling with 5 foot of 6 mil visqueen to create a bond break at existing grade.

Provide a minimum of 2 sets of Beaded Stream thermistor strings that shall become property of Owner and shall be stored as directed by owner.

02500 DRAINAGE

Identify where snowplow will stockpile snow and allow for spring drainage.
Positive drainage away from buildings must be provided. Finished floor elevation must be a minimum one foot above surrounding grade, where possible.

Provide adequate slopes in parking lots, drives and playgrounds in order to avoid ponding. Do not interfere with natural drainage of adjacent properties. Visit the site when it is raining and observe actual drainage patterns.

Make sure site elevations are taken to establish school floor elevation to elevate high enough for drainage and proper run off to avoid puddle problems.

02600 SITE UTILITIES

All major underground utilities shall be adequately marked with permanent markers. Name the utility with a sign identifying depth of burial at property lines, entry into buildings and at changes in direction. These shall be properly incorporated into the record drawings.

Surface fuel storage, including day tanks, should be surrounded by a properly constructed dike and fence with a gate. Double wall tanks may be substituted for dikes if all D.E.C. and other requirements are met.
Contractors marked up record drawings, and a copy of any edited CD/CADD (AutoCAD) drawings shall become the property of LKSD. Contractor shall deliver them along with mylars and blue lines to LKSD.

02800 SITE IMPROVEMENTS

All exterior hose bibs must be freeze-proof.

Coordinate with LKSD on play and recreation facilities.

Fences: Coordinate height (8' maximum) with LKSD to achieve desired control.

Gates: These must be of adequate size and location to allow for snow removal and equipment. A twelve inch (12") minimum height above grade is required.

Snow control design measures should be considered. Properly designed snow fences may reduce annual snow removal costs.

Provide expansion joints where walks join buildings. Cover with thresholds at doorways.

Fence fabric shall be specified "knuckle-knuckle." Barbs up are not allowed.

Plant grass or hydro-seed at all disturbed areas. Repair all damages to tundra including ruts, holes, etc.

03300 CAST IN PLACE CONCRETE

Testing shall be arranged by contractor and paid by Owner.

Cold Weather concreting should conform to ACE 306 requirements.

Use air entrainment in all concrete exposed to freezing temperatures.

Exposed concrete walls should be sacked, brushed, broomed

Make sure all entry concrete walls are brushed or broomed.

Make sure all entry concrete by school entrance and exits have proper footing depths to prevent frost heave into doors.

All slabs should have sawn or trawled control joints at proper spacing to control shrinkage cracking.

Consider slab on grade in lieu of crawl space and wood floor structure. If slab on grade is used, need to address maintenance access issues.

04000 MASONRY

Testing shall be arranged by Contractor.

Cold weather masonry should conform to "recommended practices and guide specifications for cold weather masonry construction" by International Masonry Industry or similar.

Exposed masonry walls should be brushed or broomed after jointing.

Storage and placement of CMU's must be protected from water inundation and/or rain.

Require CMU's that have a smooth surface free of excessive voids or protrusions. Both long surfaces must be brushed free of aggregate crumble.

Be aware of long delivery steel that may delay project.

In conditions with severe weather and saltwater exposure, minimize exposed metalwork. Specify finishes which minimize potential corrosion. Stainless steel will rust and discolor if not properly specified/stored.

Require that allowable stress for A36 steel be de-rated for use in cold temperature applications.

06100 ROUGH CARPENTRY

All doors w/o closers require door stops. Provide backing for all wall mounted door stops.

Provide backing for wall hung lavatories and toilets, pegboard, gym equipment, chalkboards and tack boards, toilet partitions, toilet accessories, drapes, movie screens, and all other wall or ceiling mounted equipment.

Identify blocking required during shop drawing approval. Installation of G.W.B. cannot proceed until all blocking has been checked against approved shop drawing, and equipment list.

Contractor is required to call for inspection of insulation and vapor barrier in each area 24 hours in advance of GWB installation.

Provide 8' height plywood backing for GWB in hallways.

06170 PREFABRICATED STRUCTURAL WOOD

Industrial grade glue-laminated members must be adequate for appearance or better. Glue-lam materials should not be used in exterior applications, unless approved by LKSD. If used, need to address waterproofing.

Carefully detail all connections and closely check shop drawing for connections.

07150 DAMPROOFING

Provide vapor barrier under slabs where high moisture content in sub-soils, or where concrete floors will be painted or have special floor coatings. Pour all slabs on sand or gravel base if possible.

Vapor barrier may also be appropriate in crawl spaces to minimize transference of existing soil contamination into crawl space area.

Bituthane waterproofing recommended on foundation walls where required.

No plywood siding installed unless approved by LKSD. If used, provide extra backup with 15# felt or other method. Use Tyvek™ or similar air barrier.

07200 INSULATION

Provide vents so all insulation can breathe.

Fiberglass batt insulation in metal stud walls must be full 16" or 24" wide to prevent sagging. Require Contractor to call for inspection of insulation and vapor barrier in each area 24 hours in advance of G.W.B.

When foam panels are used, the walls shall be no less than 8" thick and the ceiling and floors shall be no less than 12" thick.

Insulation and vapor barrier. All seams, edges and penetrations in vapor barrier must be taped with tape adequate to seal joints. Overlap vapor retarder a minimum of 2 (two) stud widths. Require inspection and sign-off for installation.

07400 PREFORMED ROOFING AND SIDING

Provide highest quality system with minimum slopes for the climate. Systems and details must be designed with extreme care. Alternative roofing systems should be investigated and reviewed closely with LKSD. Very tight specifications should be written for all roofing components. Shop drawings must be required for all items including flashings, expansion joints, drain details and insulation applications. Metal siding with baked on enamel finish is acceptable. Heavy-duty gauge (minimum 26 ga.) is required. Shop drawings must be checked thoroughly and actual application monitored in the field continuously by qualified personnel throughout the roofing process. Encourage fabrication of rolled metal roofing on site.

Hypalon (single-ply membrane) roofs are not acceptable.

Provide one (1) roof access minimum for school building.

07600 FLASHING AND SHEET METAL

Prefer Ceraloy, Lexsuco reinforced flashing or equal flexible flashing. Flashing joints should be sealed with butyl rubber. Coping joints should be sealed with butyl and reinforced to prevent separation due to uneven weight distribution around joints.

Avoid field painting of aluminum flashings. Use anodized or factory applied kynar finish aluminum. Verify gauge.

Skylights are not acceptable. Our experience is that they are costly, are subject to vandalism and require excessive maintenance. Clerestory windows are acceptable, but need to be carefully detailed.
Roof expansion joints and penetrations require extra attention and adequate detail.

Coordinate Owner supplied equipment with roof installation, i.e., satellite dish, antenna, weather instruments, etc.

Provide specially designed roof flashing where a new roof joins an existing building. Substantial differential settlement should be anticipated over the life of the building.

No satellite dish can be mounted on the roof.

07900 SEALANTS

Minimize reliance on sealants in exterior wall systems. Specify highest quality products and verify compatibility with adjacent materials. Inspection and proper detailing is essential.

Two-part pour in sealants work well on flat walks, but must be applied only during warm weather. Make sure all manufacturer's instructions are closely followed for all sealants.

08200 WOOD and PLASTIC DOORS

For fire rated "solid core" doors, specify additional wood back-up at points of attachment for butts, door closures and knob. Special packaging of doors to protect from moisture during shipment will reduce warping.

08300 SPECIAL DOORS

Provide adequate bracing of overhead door roller channels. Overhead door locks are required and should be keyed to master system. Careful attention to selection and insulation of overhead doors is required to prevent heat loss.

Avoid mechanical linkage door seals on overhead doors.

Require any roll-up doors on fire alarm system be on stand alone smoke sensor.

Prefer no side coiling doors or grills.

Minimum glass in interior doors/prefer relight window.

08400 ENTRANCES

Require removable, keyed center mullions for all double doors.

No glass in bottom half of doors and entries; use insulated panels on exterior door.

In selecting exterior door material, structural strength is more important than R-value since doors are typically in vestibule condition. Investigate corrosion resistant exterior doors. All of the exterior doors are to be insulated. Install polycarbonate panels at all exterior doors with glass as well as gym doors with glass. Mount polycarbonate panels on exterior at exterior doors and interior at gym doors.

Grating outside of entry (preferably under overhang) with minimum 6" space for snow and mud, below bottom of grate. Galvanized steel preferred with small panels less than 75 pounds to allow for removal. Drain pit. Coordinate with requirements at handicapped entry.

Specify a grating that does not have excessively rough teeth. Walk-off mats/carpet.

Crosswalk or grating in foyer. Recess slab and provide transition angle.

Research need for push button or 4041 LCN for handicapped entries. Avoid push button openers unless required to meet code. Note: Use proper type of LCN door closures.

Provide expansion joint at thresholds and assure thresholds are wide enough to cover joints and provide transition between floor materials. Thresholds required at transition from carpet to wood gym floor, carpet ceramic tile, etc.

Aluminum door at entries should be avoided (problems with inadequate strength at hinges, short service life and security).
Entry grating shall meet UBC requirements (many entry grates do not meet code requirements).
Ensure that entryways are protected from rain run-off at roofs.

08500 WINDOWS

PVC window such as Northern windows with polycarbonate panels are preferred.
Substitutes accepted that meet the same specifications and are acceptable to LKSD.

Where operable windows are required, only tilt/turn design is permitted.

Require very good thermal break, where possible without reduction in durability.

Screens—*inside mounted*—for operating windows are required.

No colored or tinted glazing is permitted in exterior windows unless life-cycle costs indicate otherwise and tinting is approved by LKSD.

Provide at least two operable windows per classroom.

Window blinds. (See 12500, Window Treatment.)

Wood windows are not acceptable.

(See sections 00020, Building Configuration and 08800, Glazing for information on window sizes.)

08650 SPECIAL WINDOWS

Provide interior glass between such areas as office and shop areas, and conference areas.

08700 HARDWARE

Best locks required. No exceptions. Coordinate with Plant Facilities for keying codes, finishes, and types. Latch type on entrance type openings.

Classroom Doors: No closer unless required by code for rated assembly. Install spring loaded catch for open position. Latch shall be BEST 35H7-INL-15M-626 or similar. Function to provide exterior lock/unlock by key, interior lock/unlock by key. Operating latch from inside will allow emergency exit in locked conditions.

Provide extra lock sets: 2 classroom, 1 passage, 1 storage.

Von Duprin panic hardware, no internal or external vertical rod. Model 99 with removable, keyed center mullion is preferred. Consider Von Duprin standard and C.D. 99 Rim device.

LCN door closers required (where needed).

Keys shall be sent to LKSD Plant Facilities. Number of sets of keys shall be coordinated with LKSD. Two per lockset minimum.

Provide common key for room cabinets in all classrooms. Provide separate common key for room cabinets in Science Lab in Jr. and Sr. High School facilities. Provide locking doors on all lab storage cabinets. Key to school master key (Best's cabinet locks).

Provide locks for approximately 1/3 of all cabinets (by volume) - to be located by staff after substantial inspection. Installed by contractor.

Provide a lockable key cabinet sized to fit all keys including cabinet keys for the facility plus 25%.

Contractor to provide brass construction cores for all new locksets in Project.

08800 GLAZING

All glass must be readily replaceable. No glass will be tinted.

All replacement glass must be small enough in size to fit in a Cessna 207 including the packing crate.

All exterior glass should be protected with polycarbonate panels.

09250 GYPSUM WALLBOARD

All GWB must be attached with screws only. No nailing is acceptable.

Not recommended for restrooms or shower rooms, use wonder board (ceramic product designed for ceramic tile), with ceramic tile, or thick set tile.

Provide splash protection when used near fountain or sinks. Specify water resistant GWB in bathrooms and FRP.

Provide solid framing behind all wall-mounted door stops.

Provide backing at all joints, including horizontal wall joints.

If GWB is used in hallways, 8' height continuous plywood backing is required along with 4' FRP or carpet (preferred) wainscot.

09300 TILE / FRP

Prefer FRP walls except in showers. Use FRP on walls at bathrooms, kitchens, janitor's closets, drinking fountains, cafeteria tray slide area, and as backsplash in bathrooms.

Ceramic tile is preferred on floors, walls and ceilings of shower areas. Shower rooms must have non-slip floors.

If ceramic tile is used, use wonder board backing, no waterproof GWB allowed. Special specifications for wonder board max stud spacing 16" o.c. support all joints. Shim wall flush, plumb, and square.

Thick set floors in all tiles wet areas is a must. Slope to drain 1" in 5' minimum.

Sheet vinyl is acceptable in kitchen floors. Only High quality sheet vinyl with welded seams is acceptable.

Quarry tile for kitchen floors is acceptable.

A five year warranty on all ceramic tile work is required.

Shower rooms shall have water proof membrane installed on sub-floor.

09500 ACOUSTICAL TREATMENT

Where sound treatment is necessary and lay-in ceiling panels are used, walls should extend full height and be sound treated. Caulk around perimeter of all walls.

Acoustical, 2' x 4,' lay-in suspended ceilings are preferred for classrooms, offices, etc. Provide replacement stock 10% overage.
Hallway ceiling heights should be kept sufficiently high in corridors to prevent students from jumping up and hitting ceiling. A desired ceiling height in junior and senior high schools is at least 10 feet. When ceiling heights must be lower, use impact resistant ceiling materials such as Tectum panels or plywood backed drywall.

FRP panels have proven satisfactory where ceiling is exposed to abuse.

Concealed spline ceilings are not acceptable.

Gymnasium walls require special attention. These areas are used for concerts, plays, public meetings and lunch rooms. Carpet, over GWB, over plywood is acceptable. Be sure carpet has acceptable flame spread rating. Such surface material must reach a minimum 10' high.

No suspended ceiling, with tile, is acceptable in gyms.

Un-backed, perforated CAB, Masonite, etc., is not acceptable in gyms. Walls even above 8' must be backed with a minimum of 1/2" plywood.

Prefer no acoustical metal ceilings. All classrooms, gyms, and lobby areas are to receive acoustical treatments.

09600 SUBFLOORING

All plywood underlayment must be attached to sub-flooring with glue and screw construction. Staples are unacceptable.

Exclude vapor barrier between sub-flooring and underlayment.

Sub-flooring: Required - 1 1/8" T&G.

09650 CARPETING

Carpet tiles only. Tufted construction in a textured loop pile. Minimum 20oz./sy face weight. Tweed or light pattern in classrooms. Larger patterns are acceptable in larger rooms such as Libraries.

Carpet and installation shall be warranted for wear for ten years. Contractor must provide a two year written warranty, which will replace or repair defective goods within 14 days of notice.

Carpet shall be run to manufacturer's recommendations. Indicate carpet direction on shop drawings.

Contractor to provide a five percent overrun for maintenance.

Avoid carpet in the following areas: All wet areas, Commons/Multipurpose/Cafeteria, Kitchens, Science Lab area, Shops, Physical Education, Mechanical rooms, Student Store, Storage area.

09700 SPECIAL FLOORING

Sheet vinyl is preferred at wet areas, sinks, drinking fountains, etc.

Consider rubber tile set in epoxy on multi-use floors in Commons/MPR/Cafeteria.

Locker rooms are a special case and require special design attention. Non-slip floors in shower areas and walkways are essential.

Treat all exposed concrete floors with sealant or hardener.

09770 ATHLETIC SPACE FLOORING

Hardwood, or wood parquet floors are preferred and must be considered first.
Poured urethane flooring in high school and junior high gymnasiums can be considered. Provide proper materials, quality control to prevent "dead" spots. Installer must be certified by manufacturer.

Steel splined gymnasium flooring is not acceptable.

Eliminate vapor barrier and/or seal concrete sub-floors under gym floors.

Floor sealer and finish shall be approved water base sealer.

Game line marking paint shall be compatible with flooring system and as recommended by manufacturer. Tape not allowed.

Game line layout shall be reviewed and approved by LKSD Athletic Personnel.

09900 PAINTING

Corridors, kitchens, locker rooms, restrooms require special attention; durable finish such as semi-gloss Alkyd heavy duty enamel has performed well, very smooth straight wall finishes not preferred due to magnifying of defects, prefer slight texturing or other effects. Kitchen walls must be smooth surface (epoxy paint), or FRP.

No flat latex paints allowed.

A high quality, wood stain is preferred on all interior wood surfaces.

Semi-gloss latex enamel required in all classrooms.

Hard or semi-gloss finish: All natural wood (varathane or urethane finish).

All metal doorjambs to be gloss Alkyd heavy duty enamel covered wood.

Kitchens require smooth, easily cleanable finishes, (F.R.P. preferred).
Tightly control moisture in block prior to painting.

Painted block walls are not acceptable in kitchens.

Exterior and interior block and concrete walls shall be sealed with block fill.

No exterior painting done below manufacture recommended temperature.

Prefer to minimize all exterior painting.

All exterior wood must be back primed before placed on building.

One coat of enamel undercoat is required after block-fill on block walls.

All painted metal doors and jambs must be (pre-primed), with two coats Alkyd semi-gloss oil-smooth finish.

Exterior wood buildings: If latex is used, wood should have a coat of primer and two coats of 10098 acrylic latex.

Hot dipped galvanized metal ladders, misc. metals, and handrails should not be painted.

09950 WALL COVERINGS

Open grain "natural" cork surface crumbles and is NOT ACCEPTABLE.

Walls in gym should be designed to reduce reverberation and absorb sound. This is very critical when gym is used for multiple purposes. "Sound Soak" panels work well.

10100 CHALKBOARDS AND TACKBOARDS

White boards only.

Tack boards: Require dense finish, 1/4" cork on 1/2" backing, *4' x 4'* standard with aluminum frames.

Provide tack rails in elementary school corridors.

Hallways should be provided with bulletin boards or tackable areas no larger than 4' x 8' or 32 sq. ft. per classroom as per fire marshal regulations.

10150 COMPARTMENTS AND CUBICLES

Toilet partitions: Should be ceiling mounted, with extra framing in ceiling, for attachment. Floor mounted frames are to be placed at corners and other places required for strength/durability. Top rails should be designed to discourage swinging from them. Solid plastic panels are preferred.

10260 WALL AND CORNER GUARDS

Prefer plastic or aluminum corner guards in corridors and other high use areas. Not necessary on C.M.U.

10350 FLAGPOLES

Provide 25 foot, tapered aluminum pole. Double revolving, wall-mount type. Mount at a location which can be accessed off the entry deck or ramp. No ground mounted poles. Place halyard at an accessible height..

10400 IDENTIFYING DEVICES

Provide school name on exterior of building.

Signage to be bilingual at most areas.

Review all signage requirements with LKSD. (Follow instructions in Ed Specs.)

10500 LOCKERS

Require well-ventilated lockers in locker rooms.

Prefer sloping top lockers in corridors with integral, Master brand, combination lock. Quiet lockers. Good quality heavy-duty lockers.

Coordinate with LKSD on locker types. (Prefer 12" - 15" minimum x 6')

In elementary schools, coat and boot racks are required. (No enclosed lockers in elementary school-K-4).

10600 PARTITIONS

Not permissible
Folding partitions: Not recommended, but where provided investigate use of Modernfold, Pacesetter Model 202 or approved equal. Utilize tackable fiberboard covers with vinyl fabric or chalkboards as appropriate. Provide for secure attachment to the floor when closed. No access doors should be used through partitions. Have Contractor expedite track delivery, as it is often a long lead item. Heavy duty rollers on top. Allow for beam and track settlement.

Accordion-type folding partitions are not acceptable.

Demountable, folding, portable and otherwise non-permanent partitions are not desirable unless approved by LKSD. Review bottom bracing system.

10670 STORAGE SHELVING

Coordinate with LKSD. Identify who furnishes.

10800 TOILET and BATH ACCESSORIES

Specialties: The following toilet accessories shall be Owner furnished, Contractor installed. Coordinate delivery and blocking requirements with School District Purchasing. Include:

1. *Soap dispensers*
2. *Paper towel dispensers*
3. *Toilet paper dispensers*

Mirrors: *Provide metal framed mirrors in all bathrooms above each lavatory. Restrooms serving elementary students through grade six will be safety-backed (organically coated) mirror glass. Restrooms serving junior high and high school students or that are accessible to the general public will be laminated glass combining mirror glass and heat strengthened glass. Restrooms serving staff or in-classroom restrooms will be standard mirror glass.*

Hand Dryers: *In addition to paper towel dispensers, electric hand dryers will be installed in restrooms serving the general public. In-lieu of paper towel dispensers, electric hand dryers will be installed in all restrooms associated with gym locker rooms to reduce waste and offer hair-drying capability. Mount at varying, age appropriate, heights.*

Trash receptacles should not be built into the bathrooms.

DIVISION 11
EQUIPMENT

GENERAL NOTE: Very carefully review each piece of equipment to be placed in building (i.e. size, storage, access, power required, water hookup, exhaust, code problems, etc.). Provide list of all Contractor installed equipment to LKSD Purchasing Department.

11100 BANK and VAULT EQUIPMENT

All vaults shall be fireproofed for student reference storage.

No floor safes.

11400 FOOD SERVICE EQUIPMENT

Coordinate with Food Service coordinator on each project to identify equipment and layout needed.

Coordinate carefully size of kitchen sinks, spray nozzles, dishwasher installation and size and type of trays to be used. Grease trap must be provided in kitchen, for sinks. Be sure that proper water temperature is available. Have State DEC review and approve entire kitchen prior to final drawings.

Review with owner and coordinate with registered food service consultant.

Contractor will furnish and install all large equipment.

Check with LKSD for preferred brands of equipment. Check with LKSD and size doors to fit cafeteria tables or other equipment with special width or height requirements.

Design must include adequate storage for lunch tables.

Design adequate exhaust for kitchen equipment (exhaust hoods for all heat producing equipment, exhaust fan for kitchen in general, and for satellite kitchens. Shunt trip breakers and solenoid gas valve.

Install Class 2 exhaust vents in all satellite kitchens.

Walk-in Freezer: Ensure heat-trace and insulation on walk-in freezer condensate line to floor drain. Ensure specs are clear who installs heat-trace, or install residential freezers.

Provide garbage disposal and hot water booster for dishwashing.

115213 PROJECTION SCREENS

Classrooms: Manual screens are acceptable. Screens should be 6 ft wide and have a 4:3 ratio to support a standard computer display format. An 8 ft mounting height is desirable; minimum acceptable mounting height is 7 ft. Provide a CRS devise to prevent uncontrolled retraction.

Library and Computer Classrooms: Manual screens area acceptable. Screen should have a 4:3 aspect ratio. Size the screen for a maximum width that places the bottom of screen at 44" (mounting height will govern).
Assembly spaces: In spaces under 3000sf provide an 8 ft screen width; over 3000sf, provide a 12 ft screen width. Specify a 4:3 aspect ratio. Electrically operated screens are required. At gymnasiums, the minimum mounting height should be 13 ft. Higher mounting heights should incorporate black-masked top headers to provide a bottom-of-screen at approximately 6 ft.

11500 ATHLETIC EQUIPMENT

Backboards: Coordinate with LKSD. Contractor will furnish and install, school master keyed switching. Heavy duty electric worm drive winches. Basketball rims to be safety chained to backboard.
Nevco Daktronics scoreboards are most acceptable. Be sure to provide conduit and wire to scorers location. At least one scoreboard and one scorer locations are required. Provide scoreboard protector screen.

Gym Dividers: Only roll down curtains are acceptable. Verify structural requirements.
Portable Gymnasium Equipment: Owner will supply, Contractor will install. Coordinate floor plates and anchors. Prefer Porter, Nissen Plates. Provide built-in floor plates and pockets for volleyball nets must be re-enforced for net tension.

Hydrotherapy equipment shall be Contractor furnished and installed with permanent UL approved electrical connection. Ground fault protection is required.
Require double metal doors for gym equipment storage room.

Provide adequate mat and gym storage in, or adjacent to, Gym.

11600 INDUSTRIAL EQUIPMENT

If paint spray booths are required, specify Contractor furnish and install. Vented to outside.

Require master shunt trip for all rotating shop equipment. Provide floor dust collection intakes. Provide dust collection to all dust producing shop equipment.

Suggest separate room for dust collector. Coordinate closely dust collection system and shop equipment.

Shop Equipment: UL approved. Owner Specified, Contractor furnish and install. Coordinate size, type, etc. All work benches shall be equipped with given disconnect air hoses and piping.

Provide eye wash in all shops.

11700 LABORATORY EQUIPMENT

Require automatic emergency shower/eyewash station, with floor drain. Provide acid proof drains, tops, and sinks. All lab sinks must have trash trap, for easy clean out.

Fume hood shall have explosion proof motors, lights and switches. Duct hoods directly to exterior of building. No cement asbestos board.

At Art Rooms, Kilns shall have exhaust vented to outside with explosion proof motors, lights, switches. Prefer down-draft system.

Provide acid proof and flammable chemical cabinets – lockable and vented.

DIVISION 12
FURNISHINGS

12300 CABINETS and STORAGE

Plastic laminate cabinets: Prefer Monitor, Fleetwood Harmon (Coastcraft).

Wood cabinets: Prefer Kewaunee.

12500 WINDOW TREATMENT

No blinds on interior relite windows.

No blinds on interior doors.

Prefer MechoShade roller shades or approved equal. Specify room darkening fabric. Coordinate with windows: Provide one per window section; coordinate with operable windows. Provide backing as required.

Consider providing drapes in Commons for acoustics. Contractor furnish and install.

12700 SEATING

Bleachers: Prefer closed deck and end panel design. Installation should be by factory trained personnel. Locks shall be required with Best keys coded to building master. Key-on wall outlet must be visible to see bleacher from front.

Metal bleachers are not acceptable. Interkal is not acceptable.

Wood bench seating is acceptable.

DIVISION 15
MECHANICAL

15010 GENERAL PROVISIONS

As-built drawings are essential. This must be spelled out very clearly in the contract documents and must be diligently pursued during construction by Owner, Designer, and Contractor.

Inspection: Mechanical inspection is critical, particularly anything underground, before covering.

15050 BASIC MATERIALS and METHODS

Need to keep all plumbing vents and generator exhaust well separated from fresh air intakes.

No vitriolic piping shall be used for heating pipes or domestic water line.

Prefer 3' wide pipe chases, 18" too small. Provide lockable, keyed to master access door and light with "in-use" lighted switch, located outside of room.

Ball valves preferred in all locations, full flow with stainless steel ball. At some locations Gate valves may be acceptable, if limited space/poor access would make Ball valves hard to use.

Shutoff valves must be installed at each use station and in pipe chases.

Provide Ball valves on 3/4" or larger air bleeders.

Provide 6 oz. canvas jacket on ductwork over insulation.

Copper piping is preferred inside the building for domestic water supply; type L or better. Pex pipe may be considered for domestic water lines. (Check with District.) Use P.E. pipe outside building (it can freeze without breaking).

Prefer Powers shower mixing valve or Delta. Prefer Powers or Delta individual shower mixing valves.

No single water temperature systems are acceptable. Hot water system must be coordinated with LKSD. Areas in kitchen need separately controllable water to 160^0f.

Threaded pipe is acceptable up to 3".

LKSD preference on all mechanical pumps: Grundfos for circulating pumps, Gould for water pumps.

Avoid 3 phase on pumps below 1 hp. Specify 110 or 220 volt.

Do NOT oversize circulation pumps.

Utilidors are required for plumbing under building. Utilidors must have 4' removable insulated side doors. Any sewer lines in utilidors should be raised off the bottom to prevent freezing. Install lockable, (keyed to master key), access doors at all enclosed valves.

15300 WASTEWATER TREATMENT and DISPOSAL

Prefer no solenoid valves on high pressure lines, unless shock arresters are installed.

Provide adequate floor drains in mechanical rooms, generator rooms, boiler rooms. Would like floor sinks in boiler rooms. Slope to drain 1" in 10'.
Install recessed floor drains in Boiler Room near boiler relief valves.

Provide grease traps for main kitchens.

Provide Siemens sewage plant if required.

15400 PLUMBING

Prefer ABS or no-hub cast iron piping for waste and vent lines. (No ABS piping is acceptable at fire wall penetrations).

No copper drain, waste or vent pipes.

Specify water saver water closets(max 1.5 gallon per flush) and waterless urinals. Consider use of microphore toilets (2 quart per flush, air operated). Coin-operated gang showers and electronic flush valves and lavatory fixtures.

Provide full backing for wall-hung plumbing fixtures (bond beam in CMU, (2) 2 x 12 in frame wall, etc.).

Cleanouts must be properly placed and capped. One cleanout must be located within 3' of outside building and identified with 4" x 4" (approx.) marker, at least 5' above ground with base buried minimum 3'. All cleanouts inside utilidors must be within reach of access door. ALL CLEANOUTS MUST BE LOCATED ON AS-BUILT.

Isolation valves shall be provided for each plumbing group, individual sinks, water heaters, heating zones, shower columns. All valves shall be full flow ball valves with stainless steel ball. Show valves on as builts and label.

Exterior cleanouts shall not have concrete poured directly around stand pipe or cap.

Interior cleanouts shall not be covered with continuous runs of finished flooring (i.e. carpet, sheet vinyl), unless properly marked and spare matching covers and carpet or tile inserts are provided.

Wash fountains: Prefer Acorne stainless steel with foot valve. Model 3464-DO washwear multi-lav. Match heights to users. Plastic cowlings are not acceptable. Verify A.D.A. Compliance.

Provide quick disconnect couplings on all air outlets serving air powered shop equipment.

Review installation of all kitchen equipment closely, with mechanical, verify complete dishwashing system with LKSD (i.e. tray size, water temperature required, special spray nozzle, number of tubs in sink, water booster heater, etc.).

Provide vacuum breakers for all hosebibs in kitchen, janitor rooms, etc.

Use Sloan flush valves with exposed body on toilets and urinals. No exceptions except microphore.

No Delaney flush valves.
A minimum of one (1) recessed drinking fountain is required in gym area. American Standard or Haws. Bubblers to be provided along with sink in all elementary classrooms.

Provide flow restrictors on showers.

Provide recessed drains in Mechanical Room and Generator Room.

If slab on grade construction is used, consider providing underslab radiant pipe heating at Kindergarten/Preschool classrooms. This should have full back-up and be run with plastic pipe. Water temperature should be controllable.

Construct three-foot wide pipe chases wherever possible, behind toilet fixtures.

All restrooms, dressing rooms, electrical, boiler, kitchen, washer/dryer and mechanical rooms should have floor drains. Slope to drain should be 1" in 10'.

Prefer boiler exchanger on domestic hot water heaters. Prefer glycol heated hot water makers such as Amtrol or comparable type water exchangers.

Prefer separate check valve on cold water side before mixing valves (prevents potential hot water flow to cold water line).

No balancing valves used as shut off valves.

Make up fluids should be Glycol/H20 mix for boilers, manual feed only. Inhibited Propelene.

When not required for handicapped, want single handle Delta for all areas, and avoid goose neck faucets because of breakage.

Kitchen should be all-electric. Propane is not acceptable without LKSD consideration.

If propane tanks are used for kitchen cooking gas, tank enclosure should be insulated and have some form of heat for tank.

Provide a deep sink (laundry tub type) at shop area.

ID all piping in Mech. Rooms and all valves.

Install return line on fuel oil Day Tanks to main supply tank.

15500 FIRE PROTECTION

Provide ABC fire extinguishers, 10# CO_2 or NO_2 minimum (water-only and pressurized are not acceptable).

Provide 40# BC fire extinguishers for kitchen with dry chemical fire retardant.

Do not specify cold weather extinguishers inside building.

Tamper resistant cases are recommended.

Provide fire blankets and storage cabinet in Home Ec. and Voc Ed. Shops. Cabinets must be vented to outside. "B Eagle" FM model 1947, 45 gallon capacity cabinet is preferred.

Provide smoke detectors for supply and return air ducts. Connect to shut down fans and trip fire alarm. Also connect fire alarm to shut down fans.

Kitchen hood extinguisher systems shall meet current fire codes with a remote pull station connect to fire alarm panel. Place valves and parts requiring service or testing in easily accessible locations.

Provide a separate building for boilers/generators/fire pump. Place SPOT fire extinguisher unit above all boiler and furnaces and generators.

Sprinkler system pump should be diesel,preferably powered by generator. Pump must be provided with two extra sets of packing.

Sprinkler system piping shall be CPVC or Fog/mist system unless approved by LKSD.

15600 POWER OR HEAT GENERATION

Provide double-door outside access to Boiler Room and Generator Room for equipment replacement and maintenance.

Ground level double wall storage tanks shall be properly diked for fuel spills.

Provide day tanks for burners. A two pipe system, with return line to handle volume of the pump auto fill is required, The use of teflon tape prohibited on all fuel oil systems.

Size of day tank shall be large enough to supply boilers with one (1) hour running time at high fire with both boilers running and in no case shall be less than 25 gallons.

No fire producing equipment in penthouse area.

Provide a separate building for boilers/generators/fire pump.

Provide ample space in Boiler Room and around generator/air handling units to allow room to clean tubes and remove and replace equipment.

Boilers: Oil-fired Hydrotherm boilers not acceptable. Well McClain is preferred.

Provide 3 boilers on separate stacks size 45-60% max. load each.

Computerized burners on boilers are not acceptable. Use Carlin 701 CRD or comp. We are trying to get simple burners that can be serviced by our Village Maintenance men.

Provide mixing tank at boilers for Glycol/Water mix.

Circulating pumps: LKSDs' preference, is Grundfos.

Boilers: Up to 1.5 million BTU cast iron sectionals. Prefer Well McLain.

Specify low water cutoff on all boilers. Prefer float type MacDonald Miller No. 63.

No electronic low water cutoffs.
Only dry cell batteries are acceptable. (No wet cell or jell cell batteries allowed.)

Boilers must be mounted above lip of oil drip pans.

Generators must provide 20% greater power than expected peak power usage.

All Day Tanks must be a minimum of 1,000 gallons.

15800 AIR DISTRIBUTION

Require day/night cycle on all air handlers. No motion sensor activation of ventilation.

Paint-spray booths should be provided with adequate ventilation. The exhaust vent cannot be near a fresh air supply for H.V.A.C. systems.

Need to take extra consideration on air exchange in shower rooms, computer rooms, and transformer rooms.

Prefer hot water baseboard heat in facilities. This works better for emergency power, can run hot water circulating pumps when you cannot run large fans. 100% forced air results in cold spots because of short circuits.

No 100% outside air ventilation system.

Use 10% outside air system.

Do NOT exceed code on fresh air requirements.
All perimeter rooms shall have baseboard heat where possible.

Provide adequate room to service and maintain air handling units (pull coils and fan).

Air Handling Units: Pace or Trane only.

Provide throw-away type air filters with two sets of filters in base bid.

Provide access panels for re-heat coils. Upstream side of coil.

Provide for several spare access panels with locking doors to be installed in G.W.B., located by field representative of LKSD.

Provide extra ventilation in computer rooms, all shower rooms and transformer space.

Exterior vents, ducts: Problems with snow drifting and entering system, especially flush-mounted wall vents, roof top intake needs to be high enough to prevent snow blockage. Projecting vents must be very heavy duty to withstand constant high winds.

Use oversize intake vents to reduce intake air velocity, prefer intake from under building.

Noisy unit ventilators are very irritating, avoid use of unit heaters in classrooms.

Consider air handling system to be oversized by approximately 15% for future expansibility.

Note: Do not have standby generator exhaust anywhere near air intake vents.

15900 CONTROLS and INSTRUMENTATION

Alerton DDC only.

Automatic controls must be used judiciously and purpose clearly marked.

Provide blinking warning light on roof with mechanical systems tied in. Light comes on when building temperature drops below 50 F. Provide automatic telephone dialer also. Required on remote facilities.

Thermostats should not be accessible to students and covered if accessible, Unigard or equal.

Prefer Honeywell boiler controls and Belimo zone valves.

Day/night cycle timers on heating/ventilating system, with bypass timers on each zone through the DDC system.

Freeze controls for heating coils that have outside air duct to them. Prefer automatic reset.

No motion sensor activation of HVAC. Provide a manual control timer to allow for after hours use of space. Timer should be readily accessible with good signage to explain usage.

DIVISION 16
ELECTRICAL

16100 BASIC MATERIALS and METHODS

High Voltage 480/277 Electrical Systems are unacceptable.

District will accept only 3 phase W 208/120 volt system.

Provide spare conduit for electrical power, clock and speaker system, central T.V., and fire alarm system, etc., terminate in entries or at other locations where future additions or improvements might take place. Provide adequate conduit for future expansion. Consider the present and future computer use and cable T.V.

Square D panel boards with bolt on breakers are preferred. Provide 25% over required capacity. Specify in basic bid with plus or minus alternate for other manufacturers or equal.

Observe all National Electrical Code requirements.

Provide main disconnect for each facility.

No floor mounted outlets. Provide pull down ceiling recoil if outlets are required in center of classroom or power trees.

Do not skimp on outlets.

Plug mold should be 4,000 Series, 2 pc surface raceway. It should be placed above base cabinets and comply with ADA requirements. Outlets shall be placed at 18" oc in teaching areas.

Review outlet requirements on a room-by-room basis with user group.

Use stainless steel electrical cover plates throughout.

Emergency/Night Lights: Emergency lights shall be installed per code. Night lights (un-switched corridor fixtures) shall be connected to provide adequate illumination during off hours and for surveillance.

Put corridor lighting on switches.

Site Lighting: Site lighting should be under photocell control for night safety lighting.

Utility Monitoring: Electrical consumption and demand shall be monitored via a meter pulse device. Installation of the meter shall be coordinated with the appropriate utility.

Provide safe wiring of therapeutic pools. If conduit is provided, make connection under contract, ground fault protection a must.

16200 POWER GENERATION

All facilities shall have standby power generation equipment. Fuel shall be diesel, unless otherwise required. Gasoline is not acceptable. Tank heater on generators, automatic fill day tank, detail exhaust and allow large enough opening and access for replacement of entire unit. Battery float charger. In unheated areas, block heater should be connected to heat lower block engine oil as well.
Main Service: Allow for 25% future expansion, and design for minimum number of meters, so as to take advantage of demand use rates. main service not to exceed 800 amps, if more power is needed use multiple disconnects.

Prefer overhead service from property line.

Generator exhausts cannot be near or upwind of building air intakes.

16500 LIGHTING

All lights should be 120v. Special bulbs are unacceptable.

Provide a battery pack emergency light in Generator Room, Mechanical Room, Boiler Room, Corridors and any room required by code.

Provide fluorescent fixtures in Generator Room, Mechanical Room, Boiler Room, and Kitchen. Connect to "E" Panel.

Provide simple but adequate lighting in crawl spaces, pipe chases, utilidors. In these areas a lighted switch indicates when lights are on is desired, outside of room

Gym lights, exit lights in gym, outside lights and outside speakers, and emergency lights need guards. Investigate penal grade fixtures.

Investigate alternative switching of lights and possible use of energy efficient ballast.

Provide 3 lamp fixtures with double switching in classrooms.

Require vandal protection for exterior lighting.

Standardize fixtures and bulbs whenever possible.

Meet or exceed all lighting standards.

Exterior lighting shall consist of nothing larger than 30-50 watt high pressure sodium.

All fluorescent tubes must be T-8, 'Earth Green' non-hazard type. Gym lamps shall be High Output T5 type.

Only electronic ballasts are acceptable.

16600 SPECIAL SYSTEMS

Provide shunt trip switch to shut off all equipment in shops -- ready access.
No electric heat tapes.
Use L.E.D. exit lights.

16700 – COMMUNICATIONS

Provide conduit to all classroom and instructional spaces for future television systems, computer network systems, and satellite T.V.

Telephone Systems: Coordinate with LKSD.

Satellite Systems: Coordinate with LKSD on type, location.

Review public addresses systems for gym with LKSD. High noise levels should be considered in the design, to provide adequate coverage to all areas.

Provide solid-state bell system.

Provide Primex GPS system only room clocks for all sites

Interface of existing systems with additions requires extra special attention. In some cases, an upgrade of the existing may be required. Provide adequate inspection at end of project to confirm system is complete.

Provide provisions for connection of the EST3 fire alarm panel into the telephone system using an automatic dialer complete with automatic line seizure. The EST3 fire alarm panel shall be equipped with a United Security Products Inc. AD-2000F dialer. One telephone line shall be connected to the dialer to allow for local calls to be made by the EST3 panel. Connect to LKSD District Office's server utilizing 'Fireworks'. Ensure that FA system meets or exceeds spec for EST3 system.

Gym Scoreboards: Standardize Daktronics or Nevco scoreboards. Install protective screens for scoreboards. Coordinate number and location with LKSD.

Basketball Backboards: Should have redundant limit switches. Should use momentary, key switch for raising and lowering controls.

Provide Pelco or GE DVMRe video surveillance systems with small profile cameras at all entrances, lobbies, hallways, computer rooms, libraries, office areas and other necessary areas. Connect to DVR to network for remote monitoring and retrieval of footage.

Security Alarms: Should have auto-dialers with 4-telephone number dialing capabilities. Should use door switches. Provide motion detectors in office and computer rooms. Provide interior and exterior horn type sounding devices.

Require 2 or 3 strategically placed, recording video cameras. Require rooftop flashing signal and internal/external sirens.

Theater Lighting: Manufacturer must provide maintenance training, or supply a factory representative to demonstrate systems to maintenance and users.

Verify satellite dish requirements with LKSD designated vendor. At a minimum need capability of connecting from satellite feed location to each classroom. Coordinate proposed dish location with LKSD Maintenance.

Wiring

All networks will be done with CAT 5E wire. Need to have a cable tray system to manage all data/phone video cable in the facility to data/comm room. Three one and one quarter inch sleeves in hallway from the cable tray to run data and phone cable in to each classroom, office and other instructional space in the facility. In wall conduit will be stubbed above ceiling every 10 feet in office and instructional areas. All conduit ends should have nylon bushings. A separate 3/4 inch conduit will be installed for the video network. Conduit will supply cable to two locations on opposite walls in the gymnasium.

Data/Comm Room

Each site should have a data/comm room. This room should be centrally located so that it is within 250 feet of every room in the school. In the case of very large faculties or multiple outbuildings, there may be need for additional data closets with conduit connecting all. The electrical circuits for this room should be stand-alone and this room must be well ventilated (filtered ventilation) and have it own thermostat for temperature control. One wall should be covered with plywood, painted to match rest of the room, to mount patch panels, etc.

Telephone System

Provide one telephone jack per room, all wiring to run back to the data/comm. room. Nortel Meridian ICS or compact ICS (size accordingly). Check with LKSD to see if IP system is preferred phone system is required. Provide an extended capability phone in the office and another in the data/comm. room. Phone can be programmed individually. Provide for two phone jacks in gymnasium on opposite walls

Instructional Television

One coaxial cable hardwired into each room. All wires pulled back to an amplifier/selector system in the data/comm. room. Place two coaxial outlets in the gymnasium on opposite walls.

UPS

All network equipment, phone systems and servers should be on battery back up "smart" UPS. Enough UPS to handle load for 60 minutes. Equipment provided by the ISP should be on a separate UPS. The DDC system shall also be on a UPS sized to keep it operational for 60 minutes.

Line Conditioners will be located in generator room for computer equipment that will automatically adjust over and under voltages to provide AC power that meets ANSI C84.1 specifications.

Server

Apple G4 WorkGroup Severs are required.

Additional Data/Video Communications Requirements

16800 TECHNOLOGY

Provide a minimum of 2-20 amp circuits for each Server Room.

Provide a cable tray system to manage all data/video in hallways to the Data/comm room.

Provide conduit to all classrooms, instructional spaces, hallways, and gym for phone, paging, video, and computer network systems as specified. Data and phone cable may run in the same conduit; however, separate conduit shall be installed for the video network.

Provide UTP CAT 5E, 4-pair data cable, which conforms to ANSI/EIA/TJA 568A 100BaseT standard for the phone and computer network system. Each run will be an un-spliced home run from the Data/Comm room to the node location. Each cable will be marked with the same unique identifying number on both ends. Ten (10) feet of extra cable per run shall be provided in the Data/Comm room.

It is the School District preference to use Siemens CT Series Couplers or equivalent quality for all Network and Telephone connections.

Room Type	Network	Telephone
Classroom/ Instructional Room	6	1
Mechanical Room	2	1
Student Store	1	1
Kitchen/Cooks work area	1	1
Shop Room	1	1
Teacher/Admin Work Room	6	3
Admin Office	4	3
Information Center's Circulation Desk	2	1
Information Center's Computer Lab	2	1
Counselor/Flex Room	2	1
Storage/Flex Room	1	1
Special Education Room	4	2
Gym (Scorer's Table)	2	2
Main Hallway	2	2
Gym (Speaker Area)	1	1
Pay Telephone Location	0	1

All video cable will be installed as specified by the district's video design contractor. Plans will be made available at the request of the Electrical Engineer.

Room Type	Video Cable
Classroom/Instructional Room	2

Shop Room	1
Teacher/Admin Work Room	1
Information Center	1
Storage/Flex Room	1

02 - SUBSTRUCTURE

Excavate for footings and backfilling

4,000 psi concrete footings & walls (incl. forms and rebar)

2" insulation to wall

Dampproof

6" fill, Type II, 2" minus

4,000 psi concrete slab

10 mil vapor retarder

6"x6" - W1.4xW1.4 welded wire mesh

Slab cure, finish, and joints

03 - SUPERSTRUCTURE

(MEZZANINE FLOOR FAN ROOM)

W-beams

T.S. columns

Plates, anchors and grout

Bar Joists

Angles

1 1/2" metal deck, 20 gauge

Concrete topping

6"x6" - W1.4xW1.4 mesh

Slab cure, finish, and joints

Pump concrete

Steel access ladder (8'0")

(ROOF STRUCTURE)

Plates, anchors and grout

Tube steel columns

Steel joists

W-beams

T.S. bracing

Angles, connectors, etc.

3" metal deck, 20 gauge

(MISCELLANEOUS)

Testing/inspection

Crane rental

04 - EXTERIOR CLOSURE

EXTERIOR WALL

2"x10" studs, 16" o/c

2"x6" studs, 16" o/c

1/2" plywood CDX AWW sheathing

3/4" beveled cedar 10" siding, tite knot

1"x4" cedar trim

Sealant

Air barrier

R-30 batt insulation

R-19 batt insulation

10 mil vapor retarder

5/8" Type X gypboard

Tape and finish

3/4" CDX AWW plywood soffit

2"x6" framing and nailers to soffit

Rigid eave vent screen

Fascia 1/2" CDX plywood (both sides)

3/4" beveled cedar 10" siding to fascia, tite knot

2"x4" framing for fascia

Flashing

1"x6" interior trim

DOORS

Hollow metal insulated frames for 3'0"x7'0" doors

Hollow metal insulated frames for 6'0"x7'0" double doors

3'0"x7'0" hollow metal insulated single doors

3'0"x7'0" hollow metal insulated doors with vision panel (for double doors, each leaf counted separately)

Hardware for single exterior doors

Hardware for double exterior doors

Hardware for double exterior doors with panic hardware

Motorized operable accessible door

WINDOWS

Metal clad insulated windows with screens

Sills

CAULKING

Sealant and backer rod

PAINTING

Stain siding and fascia

Stain trim

Stain soffit

05 - ROOF SYSTEMS- General Contractor

GENERAL CONTRACTOR

PITCHED ROOF

5/8" fire treated CDX plywood

R-50 rigid insulation (8" plus)

5/8" gypboard sheathing

Vapor barrier

SUBCONTRACTOR

Klip Rib metal roofing including fasteners, etc.

Ice and water shield at eaves

Ridge flashing

Flashings

Fascia board and flashing

06 - INTERIORS

GENERAL CONTRACTOR

PARTITIONS

3 5/8" metal, 20 gauge studs at 16" o/c and track

6" metal, 20 gauge studs at 16" o/c and track

5/8" Type X gypboard

Tape and finish

1/2" cement board

1/2" plywood backing

2"x6" blockings

2 3/4" sound insulation

DOORS

3'0"x7'0" hollow metal frames

6'0"x7'0" hollow metal frame double door frames

3'0"x7'0" solid core doors

3'0"x7'0" solid core doors with glazed opening

Hardware for single doors

Hardware for double doors

Rolling grille at kitchen serving line

GLAZING

Relights in hollow metal frame

SPECIALTIES

Toilet partitions, HDPE

Toilet partitions, handicapped

Toilet accessories

Lockers

Chalkboards/white board

Tack boards

Fire extinguishers and cabinets

Signage

SUBCONTRACTOR

FLOOR

Carpet

Carpet inlays

Gym flooring, wood and channels

Mosaic ceramic tile

Vinyl tile

Sheet vinyl

Linoleum

Concrete sealer and hardener

BASE

4" rubber

6" coved

Ceramic tile base

Wood base

WALLS

Paint (3 coats)

Ceramic tile

Vinyl wall covering (14 ounce)

FRP board

Carpet

CEILINGS

Acoustical ceiling tile glued to gypboard

Suspended acoustic ceiling

Suspended gypboard taped and sanded

Paint gypboard ceiling

PAINTING

Interior trim and sills

Single door frames

Double door frames

Doors

Paint miscellaneous metals

08 - MECHANICAL

PLUMBING

Cast Iron Waste, Vent Pipes and Fittings

4" diameter pipe

3" diameter pipe

2" diameter pipe

1 1/2" diameter pipe

4" floor cleanout

3" VTR

4" VTR

Hot and Cold Water Copper Pipes and Fittings

2" diameter copper pipe

1 1/2" diameter copper pipe

1 1/4" diameter copper pipe

1" diameter copper pipe

3/4" diameter copper pipe

1/2" diameter copper pipe

2" diameter coupling

1 1/2" diameter coupling

1 1/4" diameter coupling

1" diameter coupling

3/4" diameter coupling

1/2" diameter coupling

2" diameter fittings (tee/elbow)

1 1/2" diameter fittings (tee/elbow)

1 1/4" diameter fittings (tee/elbow)

1" diameter fittings (tee/elbow)

3/4" diameter fittings (tee/elbow)

1/2" diameter fittings (tee/elbow)

Clips and hangers to support pipes

Valves and gauges

1" insulation

PLUMBING FIXTURES

Standard closet wall, flush valve and carrier

Standard closet, handicapped

Urinal, flush valve and carrier

Counter mounted lavatory basin

Mop sink

Stainless steel drinking fountain cooler with bottle refilling station

Stainless steel classroom sink

Work room sink

Nurse's sink

Three compartment sink

Hand sink

Shower stall and controls

Connection to kitchen equipment

2" to 3" diameter floor drain

Hose bib, non-freeze

119 gallon hot water generator

Circulation pump

20 GPM grease interceptor

HEATING

1,600 MBH cast iron oil/gas fired boiler, hot water/glycol complete with controls

10" diameter stainless steel flue and breaching, double wall

Flue cap

55 gallon expansion tank

Air separator, 3" strainer

Glycol make-up tank with feed pump

Glycol fluid

3" diameter circulation pump

3" diameter copper pipe

2 1/2" diameter copper pipe

2" diameter copper pipe

1 1/2" diameter copper pipe

1 1/4" diameter copper pipe

1" diameter copper pipe

3/4" diameter copper pipe

3" diameter coupling

2 1/2" diameter coupling

2" diameter coupling

1 1/2" diameter coupling

1 1/4" diameter coupling

1" diameter coupling

3/4" diameter coupling

3" diameter fittings (tee/elbow)

2 1/2" diameter fittings (tee/elbow)

2" diameter fittings (tee/elbow)

1 1/2" diameter fittings (tee/elbow)

1 1/4" diameter fittings (tee/elbow)

1" diameter fittings (tee/elbow)

3/4" diameter fittings (tee/elbow)

Clips and hangers to support pipes

Valves and gauges

1 1/2" insulation

Cabinet unit heaters

Unit heaters

(2) rows fin tube and enclosure

COOLING (SUBCONTRACTOR)

10 ton, DX type electric air conditioner unit

Make-up system equipment

Refrigerant, 30 lbs. cylinder

2" diameter coolant supply and return pipes with fittings

1" diameter coolant supply and return pipes with fittings

2" diameter circulation pump

Valves and gauges

(2) rows coil (10 SF)

1 1/2" insulation

AIR SYSTEMS

32,000 CFM air handling unit

2,000 CFM to 3,000 CFM exhaust fan

750 to 1,500 CFM exhaust fan

200 CFM to 750 CFM exhaust fan

500 CFM VAV boxes

2 SF heating coils

Galvanized ductwork with hangers and connections

10" flexible duct

Outside air/exhaust louvers with bird screens

Dampers under 1 SF

1 SF to 2 SF dampers

2 SF to 5 SF dampers

1 SF to 2 SF motorized dampers

Small grille, register or diffuser

Medium grille, register or diffuser

Large grille, register or diffuser

2" insulation

2" lining

CONTROLS, TESTING AND BALANCE

Microprocessor, digital equipment, software and programming

DDC points

Thermostats

Thermostats with guards

Testing and balancing

Commissioning

FIRE PROTECTION

Sprinkler riser and valves

Fire department connection

Wet sprinkler system throughout facility

Design fee and commissioning

GAS/FUEL OIL

1" diameter black steel pipe supply line including fittings

Connection to equipment

50 gallon day tank with duplex pumps

3/4" diameter black steel pipe including fittings

Valves

Connection to equipment

Testing

09 - ELECTRICAL

SERVICE AND DISTRIBUTION

1,600 amp main enclosed disconnect

MDP main distribution panel with 1,600 amp bus and fused switches

3 1/2" diameter rigid steel conduit and fittings

3 1/2" diameter x 90° elbow

2" diameter IMC conduit

1 1/2" diameter IMC conduit

1 1/4" diameter IMC conduit

1" diameter IMC conduit

500 KCMIL copper wire

#1/0 THHN copper wire

#2 THHN copper wire

#4 THHN copper wire

#4 ground wire (10'0") and connect to building

225 amp, 120/208V, 4 wire, 3 phase, 42 circuits, MLO subpanel

100 amp, 120/280V, 4 wire, 3 phase, 30 circuits subpanel

FIXTURES

2'0"x4'0" LED troffer

1'0"x4'0" LED troffer

4'0" surface LED wraparound

6" diameter surface wet location LED downlight fixture

LED high bay gym fixture

LED exit signs with battery

Self contained dual head emergency light

LED wall pack with cut off optics, building mounted exterior light fixtures

Recessed soffit LED fixture with tempered lens, tamperproof

DEVICES

Single switch

Three way switch

Keyed switch

Dual technology occupancy sensor

Occupancy sensor/switch

Wall switch with built-in motion sensor and control switch

20 amp duplex outlet

GFI duplex outlet

Quadraplex floor outlet

GFI 15 amp duplex outlet, weatherproof

50 amp special outlet

30 amp special outlet

Junction box with cover

Emergency light connections

Night light connections

100 amp, 4 pole electrical HID contactor

K-1900 photocell/time switch

30 HP, 3 phase, 208 volt motor connection

10 HP to 7 1/2 HP, 3 phase, 208 volt motor connection

5 HP to 1 HP, 3 phase, 208 volt motor connection

Fractional motor connection

Thermal switches

60 amp, 3 pole fused disconnect switches

Fused disconnect switches, weatherproof

10 HP combination motor starter/disconnect switch

Conduit and Wiring

1" diameter EMT conduit

3/4" diameter EMT conduit

1/2" diameter EMT conduit

#6 THHN

#8 THHN

#10 THHN

#12 THHN

FIRE ALARM SYSTEM (ADDRESSABLE)

16 zone fire alarm control panel, including standby batteries and charger

Fire alarm graphic annunciator

Manual pull station (break glass type)

Combination horn/strobe

Combination horn/strobe, weatherproof

Strobe only

Magnetic door hold release

Smoke detectors ionization

Heat detector

Duct detector

Connect to trip circuit

Connect to TTB

Connect to intercom system

Tamper switch connection

Flow switch connection

Junction box

1" diameter EMT conduit

6 strand fire alarm wiring

DATA/TELECOMMUNICATION SYSTEM

4'0"x8'0"x3/4" AC grade plywood backboard

50-pair telecom termination blocks

19"x84" free-standing data equipment racks

Plug strips

48-port patch panels

Cable management panels

Fiber optic cable patch panels

Connection to fire alarm system

Single jack telephone outlets

Single jack data/telephone outlets

Two-jack data/telephone outlets

Three-jack data/telephone outlet

Four-jack data/telephone outlet

Two-jack data/telephone outlets, floor mounted

Four-jack data/telephone outlets, floor mounted

Three-jack data/telephone outlet, ceiling mounted

Wireless access points

Smartboard interface

Junction boxes

12" cable tray

4" diameter EMT conduit

3" diameter EMT conduit

1" diameter EMT conduit

3/4" diameter EMT conduit

Category 6 data cable

100 pair Cat 3 copper voice backbone

50 pair Cat 3 copper voice backbone

12-strand fiber

Single mode fiber

Ground bar

#2/0 bare copper ground

PUBLIC ADDRESS SYSTEM

Link module

Power amplifier

Equipment rack

Power amplifier

AM/FM tuner

Cassette deck/CD player

Clock/speaker

Digital clock

Speakers

Speakers, weatherproof

3/4" diameter EMT conduit

4-pair Cat 3 wire

25-pair Cat 3 wire

SECURITY SYSTEM

12-zone security control panel with keypad, including stand-by batteries and charger

Headend equipment

Classroom door lockdown hardware/interface

Card readers

Door security contact

Glass break detector

Infrared motion detector, long coverage

Connection to fire alarm system

3/4" diameter EMT conduit

6-plenum security wire

Camera cable

SET, RESET AND LOCKDOWN FEATURES

Set, reset and lockdown system interface with door access system (allowance)

VIDEO SURVEILLANCE SYSTEM

Data network switch, VOIP network switches, VOIP server

CCTV server

Video recording and monitoring equipment

Interior ceiling mounted cameras

Exterior cameras, weatherproof heated enclosure

3/4" diameter EMT conduit

Category 6 cable

6 strand fiber optic cable

PUBLIC ADDRESS SYSTEMS (GYM AND STAGE)

Mixer/pre-amplifier

Eight channel auto/gate

Equalizer

Power amp

Power amp, dual channel

CD multi-player

AM/FM tuner

Speakers

Wireless receiver

Stand type microphones

Desk top microphones

Wireless microphones

Microphone floor outlets

Microphone stands

Equipment racks

Over-voltage protection

Microphone cable

Cat 6 speaker cable

HEARING IMPAIRED AUDIO SYSTEM

Master transmitter

Slave transmitter

Infrared radiator with wire guard

Stethoscope style receiver

Lanyard style receiver

3/4" diameter EMT conduit

Cat 6 wiring

EMERGENCY POWER

150 KW oil-fired emergency diesel generator including accessories and fuel tank

Connection to leak detection system

Connection to level indicator

600 amp automatic transfer switch

600 amp emergency distribution panel

100 amp, 120/208 volt, 30 circuits MLO emergency panel

225 amp, 120/208 volt, 42 circuits, 4 wire, 3 phase MLO standby panel

1 1/4" diameter EMT conduit

2" diameter EMT conduit

2 1/2" diameter rigid steel conduit with fittings

#2 THHN copper

#1/0 THHN copper

#3/0 THHN copper

#4/0 THHN copper

MISCELLANEOUS

Testing and certification

10 - EQUIPMENT AND FURNISHINGS

SPORTS EQUIPMENT

Practice basketball goal, wall mounted (height adjustable)

Fixed basketball goal, structure mounted

Floor markings (subcontractor)

Floor inserts

Chinning bar

Climbing pegboard

FOOD PREPARATION AND LAUNDRY EQUIPMENT

Refrigerator

Freezer

Convection oven

Stacked washer and dryer

Range with hood

Under counter refrigerator

PROJECTION SCREENS

70"x70" manual projection screen with glass beaded viewing surface at classrooms

FURNISHINGS

Horizontal window blinds

Rubber entry mat

Plastic Laminated Casework

9" deep x 12 3/4" high plastic laminated boot cubbies with (2) open face compartments with top shelf

Overall 20'0" long x 2'6" deep x 3'0" high (2) tier receptionist desk with doors, knee space, drawers one side and plastic laminated top

3'0" high base cabinet including top

36" wide x 2'6" high x 14'0" tub storage cabinets

4'0" wide x 7'0" high storage cabinets with adjustable shelves

3'0" wide x 7'0" high lockable cabinets with rod and shelf

2'6" high wall units

1'6" high open shelf units

Kitchenette base unit

Wall mounted cabinet

3'0"x3'0" music room and waiting closets

12" high x 17'6" wide cubbies in kindergarten

IMC stacks

13 - SITE AND INFRASTRUCTURE
General Contractor

SITE PREPARATION

Clear site, grub up roots and remove from site (excludes trees)

Staking and survey

SWPPP including inspection and maintenance

Dewatering pump

Excavate and remove material from site

Geotextile fabric

Type 2 filling and compaction, 4" minus

Dust control

Compaction tests

SITE IMPROVEMENTS

Type 2 filling and compaction, 4" minus

4" D1 base course

2" asphalt paving

Joint to existing

Marking

24" diameter, 14 gauge CMP culvert

Traffic sign, post and footing

Concrete curbs

4" concrete walks

Landscaping

Topsoil

Seeding

6'0" to 8'0" birch

8'0" to 10'0" mountain ash

6'0" to 8'0" crab apple

15" to 18" cotoneaster

3'0" to 4'0" spirea

1"x4" pine edging

Mulch wood chips

Site Furnishings

Building sign

Bike rack, 14 bikes

8'0" aluminum bench with back

24" square x 30" high trash receptacle

30'0" aluminum flagpole and concrete base

Playground

50'0"x60'0" game time composite play structure

Swing sets, 2 seat structure

4'0" crawl tube

Soccer goals (2 each)

2 1/2" thick interlocking rubber tiles, 24"x24" safety surface (6'0" rated fall)

Fence

6'0" high chain link fence

6'0"x10'0" gate

UTILITIES

Trench for gas pipe with bedding and tape

4" diameter sewer line

Manhole

Connect to existing

4" diameter DI water main and fittings

4" hydrant

4" valve, valve box and marker, 10'0" deep

Connect to existing

Excavate trench and backfill and tape

Testing and cleaning

5,000 gallon fire guard double wall above grade fuel oil tank

Leak detection system

Testing oil

1" diameter black steel pipe and fittings

Trench, backfilling and tape

4'0"x8'0" concrete pad

6'0" chainlink fence (small quantity)

6'0"x10'0" gate

Testing

13 - SITE AND INFRASTRUCTURE
Subcontractor (Site Electrical)

POWER

4'0"x5'0" concrete transformer pad

6'0" chainlink fence (small quantity)

6'0"x3'0" gate

Utility transformer

Primary service

Trench, tape and backfilling

3/4"x10'0" ground rods, clamps and 10'0" #4 bare copper

#3/0 copper ground wire

4" diameter RGS conduit, concealed

Elbow

350 KCMIL secondary conductors, XHHW

Transformer connection and bushing

AREA LIGHTING

8" diameter x 15'0" extra strong driven steel pipe pile foundation with welded top

24" diameter x 36" concrete collars at base

6" square x 25'0" steel pole mounted to pile cap

250 watt LED fixtures with mounting arms

Trench, tape and backfilling

1" diameter PVC conduit

#10 wiring XHHW

DATA/COM

Trench, tape and backfilling

2" diameter PVC empty conduit

Pull wire for cable service

MISCELLANEOUS

Testing and certification

12 - GENERAL REQUIREMENTS AND PROFIT

Mobilization (temporary facilities)

Construction fence

Incidental freight

Final clean-up and demobilize

PROJECT OVERHEAD

Site office and temporary facilities

Equipment including part time mechanic

Tools, consumables, scaffold

Utilities, lighting, power and communications

Cleaning site/snow removal

Winter protection

Protection building/barriers

Testing, submittals, as-builts

Labor contract filing fee

Remove construction debris

Fuel for equipment

Printing, photographs, videos

Permits (by owner)

Plan check and inspection fees

Project manager

Superintendent

Engineer

Scheduler and estimator

Shop and as-built drawings

Expediting

Quality control

Site staff/clerk

Home Office

Contractor's Mark-Up

Bonds and Insurances

14 - CONTINGENCIES

ESTIMATOR'S CONTINGENCY

The estimator's allowance for architectural and engineering requirements that are not apparent at an early level of design documentation

ESCALATION CONTINGENCY

The allowance for escalation from the date of estimate to the proposed bid date

Cost Format
Levels 2-4

Level 2	Level 3	Level 4	Unit	Category & Unit Definition
01	**SITE**		**AC**	**ACRES OF SITE IMPROVED**
	011	**Special Site Preparation**	**SF**	**SITE AREA REQUIRING SPECIAL PREPARATION**
		0111 Site Demolition	SF	Removal of man made objects from site and complete building demolition. Demolition SF.
		0112 Hazardous Waste Remediation	SF	Removal or remediation of hazardous materials in the soil or site structures. Remediation SF.
		0113 Building Relocation	SF	Relocation of complete structures. SF of relocated structures.
		0114 Site Shoring	SF	Shoring for site walls and building pad area (includes equipment). Shoring SF.
		0115 Site Dewatering	SF	Removal of water from site for project duration, pumping, well points or by diversion. Dewatering SF.
	012	**Earthwork**	**CY**	**TOTAL CY MOVED**
		0121 Clear & Grub	AC	Removal of vegetation from site. Clearing SF.
		0122 Excavation, Grading & Backfill	CY	Excavation and backfill of building and site (excludes utility, foundation & basement backfill; includes geotextile). CY moved.
		0123 Soil Export & Import	CY	Load, haul, and disposal of exported spoils; supply and import fill. CY moved.
	013	**Site Improvements**	**SF**	**AREA OF SITE IMPROVED**
		0131 Vehicular Paving	SF	Includes base preparation and paving, curbs and gutters and signage. Vehicular circulation SF.
		0132 Walks/Hardscape	SF	Paving, specialty paving, decorative walls, steps, boardwalks. Pedestrian circulation SF.
		0133 Sport Court	SF	Includes base preparation, surfacing, painting, and accessories. Sport court SF.
		0134 Elevated Decks, Stairs & Ramps	SF	Elevated walkways & boardwalks contiguous to building. Elevated circulation SF.
		0135 Walls	SF	Includes foundation, wall system, excavation, backfilling, drainage, etc.. Wall SF.
		0136 Landscaping & Irrigation	MSF	Planting, seeding, topsoil, and irrigation (includes sports fields). Landscaping MSF.
		0137 Fencing & Gates	SF	Perimeter, security including gates. Fencing SF.
		0138 Site Furnishing & Equipment	EA	Benches, signs, flagpoles, planters, play structures, etc. Total furnishing/equipment.
		0139 Other Improvements	SF	Snowmelts systems, water features, etc. Improvement SF.
	014	**Site Structures**	**SF**	**AREA OF STRUCTURES**
		0141 Freestanding Shelters	SF	Shelters, covered walks and covered play areas that are not attached to the building. Sheltered SF.
		0142 Attached Shelters	SF	Canopies, shelters, covered walks, and covered play areas that are attached to the building, but are not an extension of the building roof structure. Sheltered SF.
		0143 Support Buildings	SF	Complete structures; pumphouses, boiler buildings, etc. Building SF.

Cost Format
Levels 2-4

Level 2	Level 3	Level 4	Unit	Category & Unit Definition
01	**SITE (Continued)**		**AC**	**ACRES OF SITE IMPROVED**
	015	**Civil/Mechanical Utilities**	**SF**	**AREA OF SITE IMPROVED**
		0151 Potable & Fire Protection Water	LF	Water piping, storage, wells, pumps, and treatment (includes excavation/backfill). Water pipe LF.
		0152 Sanitary Sewer	LF	Sewer piping, pumping & treatment equipment (includes excavation/backfill). Sewer pipe LF.
		0153 Storm Water	SF	Piping, culverts, swales, holding areas, water/oil separators, etc. (includes excavation/backfill). Site coverage SF (see 013 quantity).
		0154 Gas	LF	Natural gas and propane piping and tanks (includes excavation/backfill). Gas pipe LF.
		0155 Fuel Oil	GAL	Oil piping, tanks, containment, & foundation. Fuel oil GAL.
		0156 Heating & Cooling Piping	LF	Steam or hydronic flow and return pipes, insulation, also chilled water piping (includes excavation/backfill). Total pipe LF.
		0157 Utilidors	LF	Concrete or wood utilidor or arctic pipe. Utilidor LF.
	016	**Site Electrical**	**SF**	**AREA OF SITE IMPROVED**
		0161 Supply & Distribution	LF	Switchgear, panels, transformers, conduit, and feeders. Conduit LF.
		0162 Lighting & Equipment	EA	Fixtures, poles, devices, panels, conduit, and wire (includes excavation/backfill). Total fixtures and equipment.
		0163 Communications Systems	LF	Trench, conduit, cable, satellite dishes (includes excavation/backfill, foundation systems, etc.). Conduit LF.
		0164 Security Systems	EA	Detection devices, CCTV system, etc. Total sensors.
	017	**Offsite Work**	**LS**	**LUMP SUM**
		0171 Offsite Paving	SF	Extension of roads and sidewalks to the site, repair of offsite paving. Paving SF.
		0172 Offsite Utility	LF	Extension and connections of utilities to the site. Utility LF.
		0173 Other Offsite Work	LS	Railroad tracks, bridges, etc.

Cost Format
Levels 2-4

Level 2	Level 3	Level 4	Unit	Category & Unit Definition
02	**SUBSTRUCTURE**		**FPA**	**BUILDING FOOTPRINT AREA**
	021	**Standard Foundations**	**SF**	**BUILDING FOOTPRINT AREA OF STANDARD FOUNDATION**
		0211 Continuous & Column Footings	CY	Excavation, base, forms, reinforcing steel, concrete, and equipment. Concrete CY.
		0212 Foundation Walls	SF	Backfill, forms, reinforcing steel, and concrete (also includes pilasters). Wall SF.
		0213 Foundation Wall Treatment	SF	Waterproofing, dampproofing, insulation, and protection. Wall SF receiving treatment.
		0214 Foundation Drainage	LF	Pipe, fill and geotextile. Foundation drainage LF.
	022	**Slab on Grade**	**SF**	**BUILDING FOOTPRINT AREA OF SLAB ON GRADE**
		0221 Standard Slab on Grade	SF	Base, vapor barrier, forms, reinforcement, concrete, joints, finish, etc. Slab SF.
		0222 Structural Slab on Grade	SF	Base, vapor barrier, forms, reinforcement, concrete, joints, finish, etc. Slab SF.
		0223 Trench, Pit, or Pad	SF	Base, vapor barrier, forms, reinforcement, concrete, joints, finish, etc. Exposed SF.
		0224 Underslab Insulation	SF	Insulation SF.
		0225 Underslab Drainage	SF	Pipe, fill and geotextile. Underslab drainage SF.
	023	**Basements**	**SF**	**BASEMENT FOOTPRINT AREA**
		0231 Basement Excavation/Backfill	CY	Excavation, backfill, and all associated hauling & disposal costs
		0232 Basement Walls & Piers	SF	Forms, reinforcing steel and concrete (excludes standard foundations - 021). Basement wall SF.
		0233 Basement Wall Treatment	SF	Waterproofing, exterior applied insulation, drain mat, etc. Wall SF receiving treatment.
	024	**Special Foundations**	**SF**	**BUILDING FOOTPRINT AREA OF SPECIAL FOUNDATION**
		0241 Piling & Pile Cap	LF	All costs associated with placement of piles and caps (includes equipment and thermopiles). Piling LF.
		0242 Caissons	LF	All costs associated with placement of caissons (includes equipment).
		0243 Grade Beams	CY	All costs associated with installation of grade beams (includes equipment).
		0244 Raft Foundation	CY	All costs associated with installation of raft foundations (includes equipment).
		0245 Arctic Foundation System	SF	Thermosyphons, etc., including trenches and insulation
		0246 Other Special Foundations	SF	Underpinning, vibroreplacement, etc. Foundation system area.

Cost Format
Levels 2-4

Level 2	Level 3	Level 4	Unit	Category & Unit Definition
03	**SUPERSTRUCTURE**		**SF**	**AREA OF FLOOR AND ROOF STRUCTURE**
	031	**Floor Structure**	**SF**	**AREA OF FLOOR STRUCTURE**
		0311 Lower & Main Floors	SF	Floor structure that bears on the substructure (includes soffit and insulation). Lower & main floor SF.
		0312 Upper Floors	SF	Floor structure that bears on superstructure columns (includes columns). Upper floor SF.
		0313 Balcony	SF	Support columns (if any), framing and deck. Balcony SF.
		0314 Ramp	SF	Support columns, framing and deck. Ramp SF.
		0315 Special Floors	SF	Raised floors, platforms, computer floors, utility distribution floors, etc. Special floor SF.
	032	**Roof Structure**	**SF**	**AREA OF ROOF STRUCTURE**
		0321 Pitched Roof	SF	Support columns to floor or substructure (if only single story), framing and deck. Pitched roof SF.
		0322 Flat Roof	SF	Support columns to floor or substructure (if only single story), framing and deck. Flat roof SF.
		0323 Special Roof	SF	Pneumatic structures, domes, etc. Special roof SF.
	033	**Stairs**	**FLT**	**NUMBER OF FLIGHTS**
		0331 Stair Structure	FLT	Stair construction costs (excludes stair finishes). Stair flights.
		0332 Stair Railings	LF	Wall mount and free standing stair railings. Railing LF.
		0333 Ladders & Steps	EA	Ladder and steps construction costs (excludes finishes). Total ladders and sets of steps.
04	**EXTERIOR CLOSURE**		**SF**	**AREA OF EXTERIOR CLOSURE**
	041	**Exterior Walls**	**SF**	**AREA OF EXTERIOR WALL SURFACE**
		0411 Exterior Walls	SF	All components of the exterior wall system (excludes interior wall finish and structure). Wall SF.
		0412 Fascias & Soffits	SF	Fascia and soffit framing and finish. Total fascia and soffit SF.
	042	**Exterior Glazing**	**SF**	**AREA OF GLAZING**
		0421 Windows	SF	Standard window, clerestory, etc. fixed or operable. Window SF.
		0422 Storefronts	SF	Nonstructural window walls (excludes doors). Storefront SF.
		0423 Curtain Walls	SF	Structural window walls (excludes doors). Curtain wall SF.
		0424 Glass Blocks	SF	Exterior wall glass block (includes reinforcing). Glass block SF.

Cost Format
Levels 2-4

Level 2	Level 3	Level 4	Unit	Category & Unit Definition
04	**EXTERIOR CLOSURE (Continued)**		**SF**	**AREA OF EXTERIOR CLOSURE**
	043	**Exterior Doors**	**EA**	**TOTAL NUMBER OF DOOR LEAFS & SPECIAL DOORS**
		0431 Personnel Doors	EA	Leafs, frames, paint, & hardware (excludes adjacent lights - 0422). Exterior door leaf quantity.
		0432 Special Doors	EA	Overhead door, revolving door, etc. Special door quantity.
	044	**Exterior Accessories**	**SF**	**AREA OF EXTERIOR CLOSURE**
		0441 Louvers & Screens	SF	To mechanical openings and penthouses. Louver and screen SF.
		0442 Sun Control	SF	Window shutters, trellis, sun screens, etc. Sun control SF.
		0443 Balcony Decking & Paving	SF	Includes balcony floor finish (excludes structure, roof membrane and roof decking & paving - 0314, 0521 & 0533). Balcony SF.
		0444 Balcony Wall & Railing	LF	Balcony wall components & railing (excludes roof deck wall & railing - 0534). Railing LF.
		0445 Other Exterior Accessories	SF	Signage, decorations, ect. Exterior closure SF.
05	**ROOF SYSTEMS**		**FPA**	**BUILDING FOOTPRINT AREA**
	051	**Pitched Roof**	**SF**	**AREA OF PITCHED ROOF**
		0511 Pitched Roofing	SF	All components of the roof system (excludes structural sheathing - 0321). Pitched roof SF.
		0512 Gutters & Downspouts	LF	All components of roof drainage system (includes splashblocks). Gutter & downspout LF.
	052	**Flat Roof**	**SF**	**AREA OF FLAT ROOF**
		0521 Flat Roofing	SF	All components of the roof system (excludes structural sheathing - 0322). Flat roof SF.
		0522 Roof Drains & Piping	EA	Drain and piping to 5' from building perimeter (includes heat trace). Total roof drains.
	053	**Roof Accessories**	**SF**	**AREA OF ROOF ACCESSORIES**
		0531 Skylights	SF	Operable and fixed roof mounted skylights (excludes clerestory - 0421).
		0532 Roof Hatches	EA	Smoke vents, access, etc. Total roof hatches.
		0533 Roof Decking & Paving	SF	Includes finish materials (excludes roofing - 0521). Roof deck SF.
		0534 Roof Deck Wall & Railing	LF	Includes finish materials (excludes roofing - 0521). Railing LF.
		0535 Other Roof Accessories	SF	Snow control, etc. Roof SF affected.

Cost Format
Levels 2-4

Level 2	Level 3	Level 4	Unit	Category & Unit Definition
06	**INTERIORS**		**GSF**	**GROSS FLOOR AREA**
	061	**Partitions/Soffits**	**SF**	**AREA OF STANDARD PARTITIONS**
		0611 Fixed Partitions	SF	All components of a partition wall system (excludes finish). Partition SF (single side).
		0612 Soffits & Ceilings	SF	Framing and sheathing of soffits and bulkheads (excludes finish). Soffit SF.
	062	**Special Partitions**	**SF**	**AREA OF SPECIAL PARTITIONS**
		0621 Operable Partitions	SF	Partition, support structure and integral finish. Operable partition SF.
		0622 Demountable Partitions	SF	Partition, support structure and integral finish. Demountable partition SF.
		0623 Glazed Partitions	SF	Glazing, finish jamb, muttins, glass block, etc. Glazing SF.
		0624 Railing & Screen	SF	Railing assemblies, chainlink, visual screens, etc (excludes stair railing). Total railing and screen SF.
	063	**Interior Doors**	**EA**	**TOTAL NUMBER OF DOOR LEAFS & SPECIAL DOORS**
		0631 Personnel Doors	EA	Leafs, frames, paint, & hardware (excludes adjacent lights - 0623). Interior door leaf quantity.
		0632 Special Doors	EA	Overhead doors, vaults, rolling grilles, fire doors, access doors, etc. Special door quantity.
	064	**Interior Finishes**	**GSF**	**GROSS FLOOR AREA**
		0641 Wall Finishes	SF	Applied finishes, acoustic finishes, etc. Wall finish SF.
		0642 Floor Finishes	SF	Soft and hard finishes, stair finishes, etc. Floor finish SF.
		0643 Ceiling Finishes	SF	Painting, acoustic finishes, etc. Ceiling finish SF.
		0644 Other Finishes	SF	Paint metals and other miscellaneous needs. Other finish SF.
	065	**Interior Fixed Furnishings**	**GSF**	**GROSS FLOOR AREA**
		0651 Specialties	GSF	Toilet partitions, bath accessories, marker boards, corner guards, wall rails, signs. Gross floor area.
		0652 Casework/Millwork	LF	Upper and lower cabinets, countertops, display cases, trim, etc. Casework/Millwork LF.
		0653 Seating	EA	Fixed units and benches. Total seating units.
		0654 Window Coverings	SF	Drapes, blinds, blackout shades, etc. Glazing SF to be covered.

Cost Format
Levels 2-4

Level 2	Level 3	Level 4	Unit	Category & Unit Definition
07	**CONVEYORS**		**GSF**	**GROSS FLOOR AREA**
	071	**Passenger Conveyor**	**EA**	**TOTAL CONVEYORS**
		0711 Elevators	STOP	Hydraulic or electric elevators. Total elevator stops.
		0712 Escalators	FLT	Single lane per flight. Total flights.
		0713 Lifts	EA	ADA requirements. Total lift quantity.
		0714 Moving Walk	LF	Single lane. Moving walk LF.
		0715 Other Conveyor	EA	
	072	**Material Handling Systems**	**EA**	**TOTAL SYSTEMS**
		0721 Elevator & Lifts	STOP	Dumbwaiters, freight elevator, lifts, etc. Total stops.
		0722 Hoist or Crane	TON	Hoist or crane, support structure and rails. Hoist or crane ton capacity.
		0723 Conveyor	LF	Baggage handling, belt type, etc. Conveyor LF.
		0724 Pneumatic Tube System	LF	Stations, tubing and equipment. Tubing LF.
		0725 Other System	EA	
08	**MECHANICAL**		**GSF**	**GROSS FLOOR AREA**
	081	**Plumbing**	**FXT**	**TOTAL PLUMBING FIXTURE QUANTITY**
		0811 Plumbing Fixtures	FXT	Sinks, drinking fountains, toilets, showers, etc. (excludes roof drains). Total fixture quantity (fixture has a supply and waste connection).
		0812 Plumbing Equipment	EA	Circulation pumps, water heaters, water softeners, etc. Total plumbing equipment quantity.
		0813 Waste & Vent Piping	FXT	Pipe, fittings, cleanouts, floor drains, floor sinks, insulation, etc. Total fixture quantity.
		0814 Domestic Water Supply	FXT	Pipe, fittings, valves, hose bibs, insulation, etc. Total fixture quantity.
		0815 Special Systems	EA	

Cost Format
Levels 2-4

Level 2	Level 3	Level 4	Unit	Category & Unit Definition
08	**MECHANICAL (Continued)**		**GSF**	**GROSS FLOOR AREA**
	082	**HVAC**	**GSF**	**GROSS FLOOR AREA**
		0821 Heating Equipment	GSF	Hydronic or steam systems. Gross floor area.
		0822 Heating Distribution Systems	LF	Pipes, fittings, valves and insulation. Pipe LF.
		0823 Ventilation Equipment	GSF	Fans, make-up units, terminals, etc. Gross floor area.
		0824 Ventilation Distribution Systems	GSF	Ducting, insulation, diffusers, etc. Gross floor area.
		0825 Cooling Equipment	GSF	Cooling methods. Gross floor area.
		0826 Cooling Distribution Systems	LF	Piping, fittings, valves and insulation. Pipe LF.
		0827 Heat Recovery System	EA	Equipment and distribution.
		0828 Controls & Balancing	GSF	Electrical or pneumatic controls and instrumentation
	083	**Fire Protection**	**GSF**	**GROSS FLOOR AREA**
		0831 Riser & Equipment	EA	Entrance, pipe, headers, valves, etc.
		0832 Sprinkler Systems	SF	Wet, dry other complete system. Total sprinkled SF
		0833 Special Fire Protection Systems	EA	Equipment and distribution
	084	**Special Mechanical Systems**	**GSF**	**GROSS FLOOR AREA**
		0841 Gas Supply	LF	Natural/propane gas storage and distribution within 5' beyond the building perimeter. Pipe LF.
		0842 Fuel Oil Supply	LF	Fuel oil storage and distribution within 5' beyond the building perimeter. Pipe LF.
		0843 Dust Collection System	EA	Equipment and distribution. Total collection points.
		0844 Compressed Air System	EA	Equipment and distribution. Total compressed air outlets.
		0845 Lab/Medical Gas Systems	EA	Equipment and distribution. Total lab/medical gas outlets.
		0846 Vacuum System	EA	Equipment and distribution. Total vacuum outlets.
		0847 Special Exhaust System	EA	Equipment and distribution. Total exhaust fans.
		0848 Humidification	EA	Equipment and distribution
		0849 Other Mechanical Systems	EA	

Cost Format
Levels 2-4

Level 2	Level 3	Level 4	Unit	Category & Unit Definition
09	**ELECTRICAL**		**GSF**	**GROSS FLOOR AREA**
	091	**Service and Distribution**	**AMP**	**TOTAL AMPERES OF ELECTRICAL SYSTEM**
		0911 Distribution Panels & Switchgear	AMP	Equipment including grounding. Total amperes of electrical system.
		0912 Panels & Motor Control Centers	AMP	Equipment including grounding. Total amperes of electrical system.
		0913 Transformers	KVA	Equipment including grounding. Total transformer(s) KVA.
		0914 Conduit & Feeders	LF	Including fittings and connections. Conduit LF.
	092	**Lighting**	**FXT**	**TOTAL LIGHTING FIXTURE QUANTITY**
		0921 Light Fixtures & Controls	FXT	Interior lights, exterior lights mounted on building, switches, etc. Total light fixtures.
		0922 Conduit & Wiring Distribution	FXT	Conduit, fittings and wiring. Total light fixtures.
	093	**Power**	**EA**	**TOTAL DEVICES AND CONNECTIONS QUANTITY**
		0931 Devices & Connections	EA	Outlets, disconnects, equipment connections, etc. Total devices and connections
		0932 Conduit & Wiring Distribution	LF	Conduit, fittings and wiring. Conduit LF.
	094	**Special Systems**	**GSF**	**GROSS FLOOR AREA**
		0941 Fire Alarm System	EA	Devices, panels, conduit and wire. Total fire alarm devices.
		0942 Communication Systems	EA	Telephone, data, intercom, cable trays/television/sound system. Total outlets.
		0943 Security Systems	EA	Detection, CCTV, accessories control. Total detection points.
		0944 Clock System	EA	Clocks, controls, conduit and wire. Total clocks.
		0945 Other Special Systems	GSF	Other low voltage systems. Gross floor area.
	095	**Other Electrical Systems**	**GSF**	**GROSS FLOOR AREA**
		0951 Power Generation & Distribution	KVA	Generators, switchgear panels, conduit, and feeders (includes grounding). Total generator(s) KVA.
		0952 Heating Systems	SF	Baseboard, unit heaters, radiator or radiant heat.
		0953 Grounding Systems	EA	Special grounding, lightning protection, etc. Total grounding systems.

Cost Format
Levels 2-4

Level 2	Level 3	Level 4	Unit	Category & Unit Definition
10	**EQUIPMENT AND FURNISHING**		**GSF**	**GROSS FLOOR AREA**
	101	**Equipment**	**GSF**	**GROSS FLOOR AREA**
		1011 Food Service/Kitchen Equipment	SF	Commercial and residential grade kitchen equipment. Space housing equipment SF.
		1012 Athletic Equipment	SF	Gym and other sports equipment. Space housing equipment SF.
		1013 Shop Equipment	SF	Wood work, engine, metal work, etc. Space housing equipment SF.
		1014 Laboratory/Medical Equipment	SF	Casework, equipment, etc. Space housing equipment SF.
		1015 Library Equipment	SF	Stacks, shelves, desks, etc. Space housing equipment SF.
		1016 Theatre & Stage Equipment	SF	Lighting, sound, curtains, etc. Space housing equipment SF.
		1017 Art Equipment	SF	Kilns, sinks, etc. Space housing equipment SF.
		1018 Loading Dock Equipment	SF	Bumpers, levelers, etc. Loading dock SF.
		1019 Other Equipment	SF	Detention equipment, etc.
	102	**Furnishings**	**GSF**	**GROSS FLOOR AREA**
		1021 Furniture	EA	Furniture that is not fixed. Total furniture quantity.
		1022 Mats	SF	Entry mats and grates. Total mat and grate SF.
		1024 Other Furnishings	EA	
11	**SPECIAL CONDITIONS**		**GSF**	**GROSS FLOOR AREA**
	111	**Special Construction**	**SF**	**AREA OF SPECIAL CONSTRUCTION**
		1111 Swimming Pool	SF	Complete with plumbing requirements. Swimming pool interior surface SF.
		1112 Ice Rink	SF	Complete with chilling requirements. Ice rink SF.
		1113 Greenhouse	SF	Complete structure. Greenhouse SF.
		1114 Marine Work	SF	Seawall, docks and piers, etc. Marine surface SF.
		1115 Other Special Facility	SF	
	112	**Special Demolition**	**SF**	**AREA OF BUILDING AFFECTED**
		1121 Non-Hazardous Demolition	SF	Selective, non-hazardous demolition. Affected building SF.
		1122 Hazardous Demolition	SF	Abatement of hazardous building materials. Affected building SF.

Cost Format
Levels 2-4

Level 2	Level 3	Level 4	Unit	Category & Unit Definition
12	**GENERAL CONDITIONS**		**MO**	**PROJECT DURATION**
	121	**Mobilization and Demobilization**	**LS**	**LUMP SUMP**
		1211 Freight Material	TON	Freight cost of materials to job site (air, barge, truck, etc.). Material weight in tons.
		1212 Freight Construction Equipment	TON	Freight cost of construction equipment to and from job site. Construction equipment weight in tons.
		1213 Labor Travel	RT	Cost of travel for construction personnel to and from job site. Total round trips.
	122	**Site Staff**	**MO**	**PROJECT DURATION**
		1221 Supervision	MO	Project manager, superintendent, foreman. Months of on-site supervision.
		1222 Engineering	MO	Engineering personnel. Months of on-site engineering.
		1223 Quality Control	MO	Personnel. Months of on-site quality control.
		1224 Scheduling/Estimating	MO	Estimating personnel. Months of on-site estimating/scheduling.
		1225 Surveying	MO	Crew to set out features of project. Months of on-site surveying.
		1226 Expediting	MO	Persons arranging deliveries. Months of on-site expediting.
		1227 Clerical	MO	Payroll, invoices, etc. Months of on-site clerical work.
		1228 Other	MO	
	123	**Temporary Construction**	**MO**	**PROJECT DURATION**
		1231 Temporary Facilities	MO	Offices, storage, signs, staging, partitions and protection, installation and use. Project duration.
		1232 Fences & Barriers	LF	Perimeter fence, security. Fencing LF.
		1233 Scaffolding	MO	Installation and rental. Months of scaffold rental.
		1234 Utilities	MO	Water, sewer, electrical, gas, oil, installation and use. Project duration.
		1235 Communications	MO	Telephone, fax, email, installation and use. Project duration.
	124	**Equipment and Tools**	**MO**	**PROJECT DURATION**
		1241 Equipment	MO	Vertical and horizontal transportation, pumps, etc. Project duration.
		1242 Tools	MO	Hand tools, manlifts, ladders, etc. Project duration.
		1243 Consumables	MO	Fuel, cleaning products, safety needs. Project duration.

Cost Format
Levels 2-4

Level 2	Level 3	Level 4	Unit	Category & Unit Definition
12	**GENERAL CONDITIONS (Continued)**		**MO**	**PROJECT DURATION**
	125	**Miscellaneous**	**MO**	**PROJECT DURATION**
		1251 Submittals/As-Builts	LS	Project records/printing costs/manuals.
		1252 Testing	LS	Material tests.
		1253 Cleaning	MO	Includes snow removal and final clean-up. Project duration.
		1254 Security	MO	Badges, security service, night watchman. Project duration.
		1255 Permits	LS	Local building permits, street-use permits, etc.
	126	**Labor Employment Costs**	**MO**	**PROJECT DURATION**
		1261 Camp	MO	Remote site needs. Months of construction camp operation.
		1262 Per-Diem	MDAY	Remote site needs. Total man days of imported personnel.
		1263 Premium Time	HRS	Payment for overtime. Total overtime hours.
	127	**Mark-Ups**	**%**	**PERCENTAGE OF DIRECT CONSTRUCTION COST**
		1271 Home Office Overhead	%	Headquarters costs. % of direct construction cost.
		1272 Profit	%	Mark-up for investment and risk, also consideration of market conditions. % of direct construction cost.
		1273 Bond	%	Performance, pay and bid bonds. % of direct construction cost.
		1274 Insurance	%	General liability. % of direct construction cost.
13	**CONTINGENCIES**		**%**	**PERCENTAGE OF TOTAL CONSTRUCTION COST**
	131	**Estimate Contingency**		
		1311 Estimator's	%	Allowance for unknown aspects of the project that may become necessary (not a change order or bid contingency). % of total project cost.
		1312 Escalation	%	Allowance for changes in costs of labor and materials from the date of the estimate to date of construction project. % of total project cost.