INTRODUCTION

Specifications define the qualitive requirements for products, materials, and workmanship upon which the content is based. They are organized into ***50*** Divisions and ***6*** digit numbering system. Section titles have been closely coordinated with the numbering system established in CSI's ***new*** Masterformat ***2004*** Edition. In certain instances, section titles vary slightly from those recommended, but only where necessary to make them correspond more closely to text subject matter.

The specifications are no more than outlines complied to establish minimum quality requirements. They do not cover all materials required for a complete Project and do not attempt to include every possible variable, particularly where doing so would require an almost unlimited number of choices. These specifications are not to be used as bid documents.

Specifying methods include both performance (a statement of required results with criteria for verifying compliance, but without unnecessary limitations on the methods for achieving the required results) and reference standard (requirements set by authority, custom, or general consensus and are established as accepted criteria). There was no attempt to establish these specifications based on proprietary specifications which identify the desired products by manufacturer's name, brand name, model numbers, type designation, or other unique characteristics.

Section format conforms to 3 part arrangement developed by CSI and accepted by the Design Professionals to achieve uniformity in locating and organizing specification content.

Streamlined language is used where possible to describe requirements for products, systems, and processes. In these instances a generic term is punctuated by a colon and then followed by a list of requirements without a linking verb such as "shall be" or "provide" which is implied by colon.

Spelling and punctuation conform as closely as possible to current standards of usage. If conflicts occur between spelling of words in the dictionary versus industry practices, the latter takes precedence.

Minimums and maximums are defined in text only where possibility of confusion exists. Otherwise, because of the nature of this document, it shall be assumed items indicated in documents are guidelines and shall be adhered to, unless discussed with state authority.

Abbreviations included in text are defined in Chapter 1.

Demolition: Although Chapter 9 does not include an outline specification on demolition, special emphasis should be placed on recycling. With a demolition project, a recommendation should stress the need to recycle ceiling tile, carpet, and other materials where recycling programs are available.

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01 DIVISION

GENERAL REQUIREMENTS

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DIVISION 01: GENERAL REQUIREMENTS

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SECTION 013100

PROJECT MANAGEMENT AND COORDINATION

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Administrative guidelines for project management and coordination.

1.2 BUREAU OF BUILDING CODE COMPLIANCE MEETING

A. Bureau of Building Code Compliance Meeting: CM will schedule a Building Code Compliance with Authorities with Jurisdiction, [Division of Industrial Compliance, 6606 Tussing Road, Reynoldsburg, Ohio 43068, (614)644-3334, www.com.ohio.gov.,] at a time convenient to Owner, CM, and A/E, after execution of the Agreement and before beginning any on-site construction activities. Hold conference at Project Site or another convenient location. Conduct the meeting to review inspection responsibilities and personnel assignments.

1. Attendees: Authorized representatives of Owner, CM, A/E, and their consultants; Contractor and its superintendent; major subcontractors; testing agency; and other concerned parties shall attend the conference. All participants at conference shall be familiar with project testing and inspection requirements.

1.3 PRE-INSTALLATION CONFERENCES

A. Pre-installation Conferences: A/E will schedule and conduct a pre-installation conference at Project Site before each construction activity that requires coordination with other construction and as indicated in the Contract Documents.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise A/E and CM of possible meeting date a minimum of 72 hours in advance. A/E will schedule meeting.

LESSONS LEARNED

3.1 Modern technology has contributed to the development of many new building products. These new products and the creative use of existing materials by some architects have lead to many innovative construction procedures. As architects take advantage of the increasing availability of new materials, complicated installation details have become standard. Consequently, many building projects now include complex assemblies of materials that require more-than-normal care to execute.

3.2 Difficult material installations and complex assemblies usually demand considerable skill on the part of the Installer. When two or more trades are involved in an installation, close coordination is necessary to achieve satisfactory results. However, when assembly or installation is difficult or intricate, close coordination between the trades is *essential* to avoid problems or material failures. This is true of the mason and roofer for coordination of the thru-wall flashing at roof-wall intersections. It is recommended that special coordination meetings be required to address issues necessary to assure quality construction.

A. When a building project requires an unusual assembly of materials, a pre-installation conference is usually advisable to review installation procedures and establish responsibilities. Pre-installation conferences are also desirable for many routine construction operations such as built-up roofing and waterproofing. To avoid problems and material failures, many architects require pre-installation conferences to coordinate the installation of specific products or systems.

3.3 Pre-installation Conferences as Quality Assurance: Many architects have found that the pre-installation conference is their first opportunity to assess the Installer's understanding of the quality requirements in the specifications, and bring to their attention any special requirements or experience from past projects that may help avoid quality issues and rejected work. Through participation in pre-installation conferences and in reviewing of mockups, the Architect is able to assist the Owner in obtaining a better quality installation; consideration should be given those work results that would most benefit from a requirement for a pre-installation conference, as the conferences require a time and cost commitment from the Contractor and from the Architect.

3.4 Advantages: During a pre-installation conference, participants review conditions under which they will perform their work, resolve minor problems that may otherwise hinder or delay progress, and discuss procedures that require cooperation.

A. A pre-installation conference should not be held just to make the parties aware of each other's problems; these issues should be discussed at a regular progress meeting before installation begins.

3.5 Timing: A pre-installation conference should not be scheduled before preliminary work is complete. However, it should be held early enough to resolve potential problems; one week before installation begins is sufficient for many installations. For complex installation involving many trades and critical substrates, several sessions may be needed to clarify all issues.

3.6 Attendees: The Contractor's superintendent, the Architect's field representative or project manager, the Construction Manager, the subcontractors, and materials suppliers should attend pre-installation conferences. Often, representatives of various manufacturers, officials of testing agencies, and local building inspection officials also attend.

3.7 Location: A pre-installation conference is typically held at the jobsite to enable participants to review field conditions and evaluate critical substrates and other preparatory work, if necessary.

3.8 Agenda: The following issues are usually discussed at pre-installation conferences:

A. Procedures Review: Participants in a pre-installation conference review essential procedures the parties must follow, from initial preparation to protecting the completed installation. The conference gives participants an opportunity to review the sequence of operations. Some projects require special procedures for an installation, and this meeting gives the parties an opportunity to ensure that everyone understands these special procedures as well as their responsibilities regarding following them.

B. Conditions Review: Participants in a pre-installation conference should review pertinent conditions about installation, including timely access to the Work and environmental concerns. This conferences gives participants an opportunity to review the status of previously completed work before installation begins. If unsatisfactory conditions are

discovered, the party responsible for the problem must take corrective action to remedy the situation without delaying progress.

C. Schedules Check: A final review of all schedules for installation is a major agenda issue for pre-installation conferences. For large installations, staggered material delivery may help maintain progress without creating storage problems on-site. However, staggered material delivery must be carefully coordinated with work progress at all stages to avoid material storage at critical points in the installation process.

D. Mockup Evaluation: On many projects, architects require the construction of mockups to establish the standard of performance of some critical construction operations. Pre-installation conferences give the participants an opportunity for a final review and evaluation of the mockups.

END OF SECTION

SECTION 014000

QUALITY REQUIREMENTS

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Administrative guidelines for quality assurance and quality control.

1.2 PRIME CONTRACTORS QUALITY CONTROL PLAN

A. Quality Control Plan, General: Each Prime Contractor shall submit quality-control plan not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.

B. Quality Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
   1. Project quality control manager may also serve as Contractor superintendent or foreman.

C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.

D. Testing and Inspection: Include in quality control plan a comprehensive schedule of Work requiring testing or inspection, including the following:
   1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.
   2. Special inspections required by authorities having jurisdiction and indicated on the "Statement of Special Inspections."
   3. Owner-performed tests and inspections indicated in the Contract Documents including test and inspections indicated to be performed by the Commissioning Authority.

E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.

F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.3 QUALITY ASSURANCE

A. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using material indicated for the completed Work:
   1. Build mockups in locations and of size indicated or, if not indicated, as directed by Architect.
   2. Notify Architect and Construction Manager seven days in advance of dates and times when mockups will be constructed.
   3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at the Project.
   4. Demonstrate the proposed range of aesthetic effects and workmanship.
   5. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
      a. Allow seven days for initial review and each re-review of each mockup.
   6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

LESSONS LEARNED

3.1 Mockups are full-size representations of the construction, materials, and finishes required by the Contract Documents. They can be used to verify selections made under Sample submittals, to demonstrate aesthetic effects, to provide coordination between elements, and to demonstrate the qualities of products and workmanship. Mockups are especially useful when quality of workmanship is a particular concern and is difficult to specify and enforce through reference to industry standards. For all but the simplest of mockups described in the specifications, Drawings delineating the extent and location of mockups are typically provided. The Architect may wish to observe the construction of mockups. The Contractor's construction schedule should indicate adequate time for construction and approval of mockups. Extensive mockups should also be included as a line item in the schedule of values.

A. Mockups may simply be a portion of the Work completed for review prior to proceeding, or they may be extensive freestanding construction intended for demolition upon completion and acceptance of the Work. The individual specification sections indicate which type of mockup applies to which element of the Work.

B. Freestanding masonry mockups can be excellent opportunities for "Quality Assurance" measures to verify flashing.

C. Integrated exterior mockups incorporate mockup elements specified in several Specification Sections into a single, usually free-standing, assembly that also demonstrates successful interface between different materials and systems. Integrated mockups may be a valuable tool in enhanced building commissioning.

D. Room mockups are full-size representative construction of one or several typical room types that may incorporate all specified materials, including fixtures and equipment. Room mockups are often used in projects to provide final verification of specified materials as well as to demonstrate an acceptable level of workmanship.

END OF SECTION

SECTION 015000

TEMPORARY FACILITIES AND CONTROLS

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Administrative guidelines for temporary utilities, support facilities, and security and protection facilities.

1.2 TEMPORARY UTILITY INSTALLATION

A. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

B. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.

1. Prior to commencing work, isolate the HVAC system in area where work is to be performed in accordance with approved coordination drawings.
   a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
   b. Maintain negative air pressure within work area using HEPA-equipped air filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.
2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust containment devices.
3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

C. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilations requirements to produce ambient condition required and minimize energy consumption.

1. Provide dehumidification system when required to reduce substrate moisture levels to levels required to allow installation, application of finishes, and minimize the potential for mold growth.

1.3 MOISTURE AND MOLD CONTROL

A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.

B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
   1. Protect porous materials from water damage.
   2. Protect stored and installed material from flowing or standing water.
   3. Keep porous and organic materials from coming into prolonged contact with concrete.
   4. Remove standing water from decks.
   5. Keep deck openings covered or dammed.

C. Partially Enclosed Construction Phase: After installation of weather barriers, but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
   1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
   2. Keep interior spaces reasonably clean and protected from water damage.
   3. Periodically collect and remove waste containing cellulose or other organic matter.
   4. Discard or replace water-damaged material.
   5. Do not install material that is wet.
   6. Discard, replace, or clean stored or installed material that begins to grow mold.
   7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
   1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
   2. Use permanent HVAC system to control humidity.
   3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
      a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective.
      b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record daily readings over a forty-eight hour period. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
      c. Remove materials that can not be completely restored to their manufactured moisture level within 48 hours.

LESSONS LEARNED

3.1 Temporary Utilities

A. Temporary Heating and Cooling: Construction procedures require minimum temperatures for proper curing or drying. Architects should specify minimum temperatures for construction operations in the Sections for specific activities. Includes requirements for minimum temperatures in enclosed portions of the building to forestall the possibility of damage to the completed construction.

3.2 Security and Protection

A. Work in facilities may require special considerations for dust control and isolation of the building HVAC system. In addition to dust-tight temporary partitions, dust controls at openings to the work area, walk-off mats, negative pressurization, and independent temporary ventilation may be required.

B. Temporary fire-protection provisions in the Section Text are essential but basic. Contractors must keep temporary fire protection operational until permanent fire protection is available. If permitted by the Owner, once permanent facilities are completed and placed in service, the Contractor may remove temporary facilities. Review provisions with the Owner's insurance carrier to see if additional provisions will result in lower premiums; also review NFPA 241, *Safeguarding Construction, Alteration, and Demolition Operations*, before editing these provisions.

3.3 Environmental Considerations

A. Mold and Moisture Protection: In order to deliver a finished facility that is free of moisture damage and mold growth, the Contractor is responsible for taking appropriate steps during the construction to control the ingress of moisture, protect hygroscopic materials, and maintain a clean jobsite. Recommended procedures for controlling moisture during construction are well presented in the Associated General Contractors of America publication, *Managing Risk of Mold in the Construction of Buildings*.

B. Dust, Fume, and Odor Control: Construction sites inherently product dust- and fume-producing environments. Work in occupied facilities poses special challenges with respect to protection of the occupants and maintenance of acceptable indoor air quality. Include general provisions for dust control, maintaining negative air pressure, and separating HVAC systems that are intended to protect occupants from pollutants generated by construction operations.

END OF SECTION

SECTION 015800

PROJECT IDENTIFICATION

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Signage identifying the construction and project team.

1.2 MATERIALS

A. Lumber and Plywood
1. For signs and directory boards, provide exterior marine plywood of sizes and thicknesses indicated.
2. Treated lumber posts.
a. Preservative chemicals: Shall contain no arsenic or chromium.

B. Paint
1. For sign panels and applying graphics, provide exterior grade alkyd gloss enamel over exterior primer.

1.3 PROJECT IDENTIFICATION

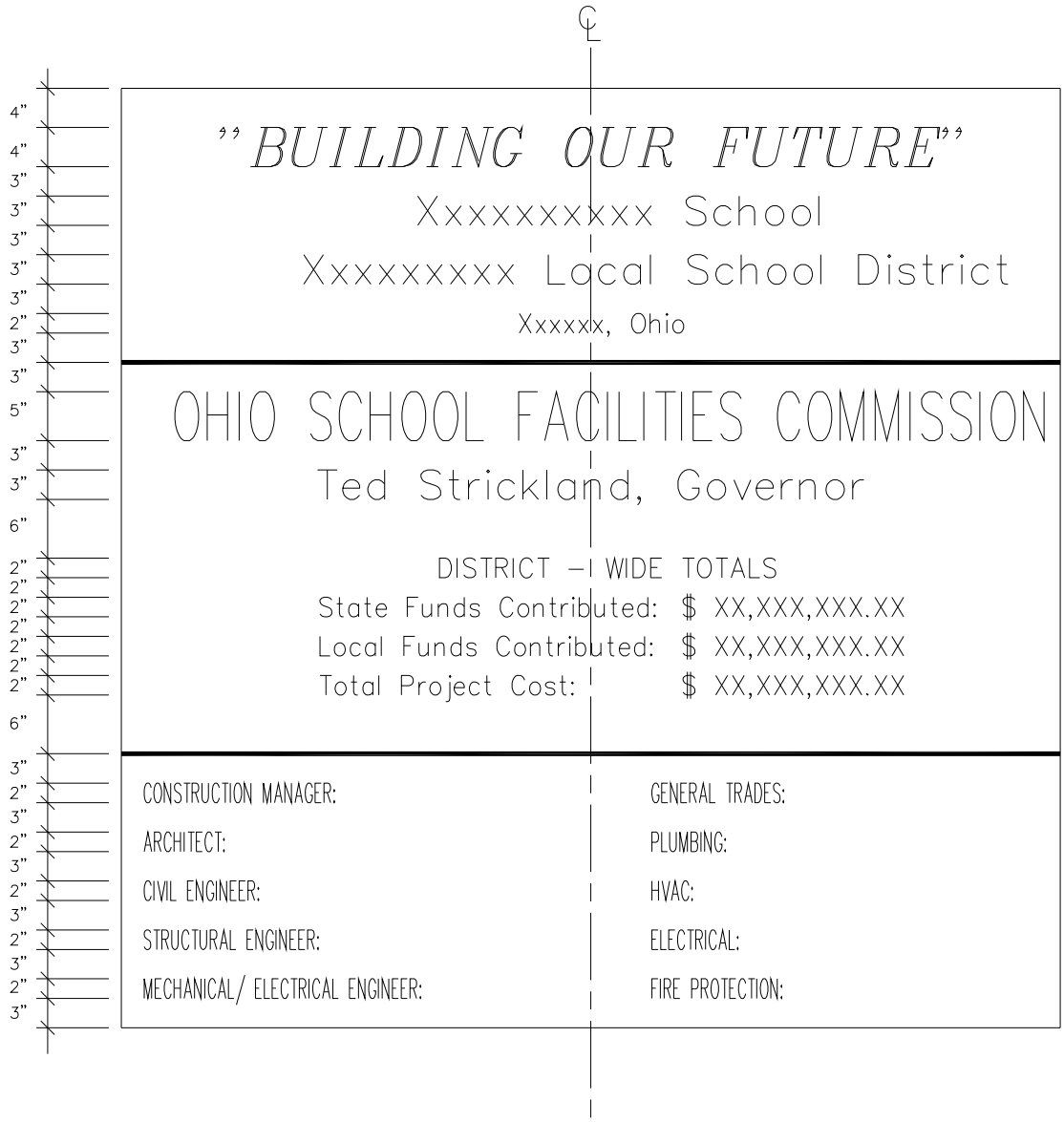
A. Project Identification and Temporary Signs: Prepare project identification and other signs of size indicated. Support on posts of framing of preservative treated wood or steel. Do not permit installation of unauthorized signs.
1. Project Identification Signs: Engage an experienced sign painter to apply graphics. Comply with details indicated.
2. Temporary Signs: Prepare signs to provide directional information to construction personnel and visitors.

LEED SUGGESTIONS

2.1 A. Credit EQ 4.4: For composite-wood products, consider using products containing no urea formaldehyde.

B. Credit MR7: For wood products consider using materials obtained from forests certified by an ***FSC***-accredited certification body to comply with FSC STD-01-001, “FSC Principles and Criteria for Forest Stewardship.”

END OF SECTION



PROJECT SIGN NOTES:

1. (1) SIGNBOARD – 8'–0" X 8'–0" X 3/4" MARINE PLYWOOD
2. LETTERS – GREEN ON WHITE BACKGROUND/STRIP AND BORDER RED/ SIZES AS NOTED
3. (2) POSTS 10'–0" (4" X 4")/FIR TREATED AND PAINTED BROWN
4. CROSS BRACE 2" X 4" X 5'–0"/LET INTO POSTS
5. (4) CARRIAGE BOLTS 5/8" X 5" WITH WASHERS
6. LOCATION DETERMINED BY ARCHITECT IN FIELD
7. LETTER STYLE TO BE "HELVETICA MEDIUM"

SECTION 017419

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Salvaging nonhazardous demolition and construction waste.

B. Recycling nonhazardous demolition and construction waste.

C. Disposing of nonhazardous demolition and construction waste.

1.2 PERFORMANCE GOALS

A. Salvage/Recycle Goals: As much demolition and construction waste as possible.

1.3 WASTE MANAGEMENT PLAN

A. Types and quantities of demolition, site-clearing, and construction waste.
1. Plan shall be approved by Construction Manager.
2. Train workers, subcontractors, and suppliers on waste management plan.
3. Distribute waste management plan to entities when they first begin work on-site.

B. Type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator.

1.4 RECYCLING WASTE

A. Recycling Incentives: Revenues and other incentives for recycling will accrue to Contractor.

LEED SUGGESTIONS

2.1 LEED for Schools includes credits for diverting materials from landfills. The project team is encouraged to work together to establish project goals for these credits.

LESSONS LEARNED

3.1 Everyone on the project team, including vendors, should be made aware of the project goals so materials are not disposed of that could have been salvaged. Signs should be posted at the waste collection areas indicating what should be done to accomplish project goals.

END OF SECTION

SECTION 017700

CLOSEOUT PROCEDURES

GENERAL GUIDELINES

1.1 TORNADO SHELTER AREAS

A. The 1999 "National Performance Criteria for Tornado Shelters" provided by FEMA recommends providing 5 SF per person standing (10 SF for wheelchair) for shelter area. The 1998 National Fire Code also has recommendations. The Design Professional for new school facilities should assist the school district in selecting the most obvious shelter areas. Shelter areas should be ADA accessible and could include toilet rooms, locker rooms, spaces below structural decks, smaller interior rooms, in spaces with short ceiling spans, and in the center of the building.

B. It is not the intent of this section to require construction or improvement of a facility or area for use as a tornado shelter. Identified spaces should avoid walls of glass, windows, skylights, exterior walls, long open corridors, and modular classroom buildings.

C. Prior to completion of required closeout items, the Design Professional shall submit, through the Construction Manager, to the school district, a floor plan indicating recommended tornado shelter areas for the building(s) involved. The floor plan shall be small scale and indicate spaces to provide 5 SF per occupant plus reasonable space for wheelchair occupants.

D. OSFC and others involved in the development of this project closeout section do not make any representation, warranty, or covenant, expressed or implied, with respect to performance or results from recommendations herein.

1.2 PROJECT RECORD DOCUMENTS

A. The Design Professional shall provide record documents to the School District prior to final completion. The record documents shall be in conformance with the requirements of A/E Contract Article 2.7.16, CM Contract Article 2.7.16 and 2.7.14, General Conditions Article GC 11.2.1, and other provisions of the closeout process as determined by the OSFC in accordance with the Policy and Procedure Memorandums.

END OF SECTION

SECTION 018113

SUSTAINABLE DESIGN REQUIREMENTS

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. USGBC Leed for Schools: Silver certification based on LEED for Schools.

B. A copy of the LEED project checklist is to be submitted by the Design Team to the OSFC at each phase submission and shall be attached to the this section for contractor's information only.

1.2 SUBMITTALS

A. LEED Action Plans: The Design Team is encouraged to work with the Construction Team to develop an "Action Plan" within 30 days of date established for the Notice to Proceed:
   1. The "Action Plan" shall indicate contractor strategies for obtaining construction phase credits.

B. LEED Progress Reports: Contractor shall, with each Application for Payment, compare construction and purchasing with LEED action plans.

C. LEED Documentation Submittals: Contractor shall provide product data, receipts, certification letters, chain-of-custody certificates, and other documentation needed to show compliance with requirements.

LESSONS LEARNED

3.1 A LEED Action Plan can provide reassurance that the contractors understand the LEED requirements and can help to clear up misunderstandings before they become a larger problem.

3.2 It Owner authorizes use of permanent heating, cooling, and ventilating systems during construction period, verify installation of filter media having a MERV 8 according to ASHRAE 52.2 at each return-air inlet for air-handling system used during construction. Verify all filters are replaced prior to occupancy with MERV 14 air filters.

END OF SECTION

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SECTION 019100

COMMISSIONING

Spec Writer Note: Development of this specification section requires coordination with the project CxA. The CxA will assist with developing this section to properly reflect the scope of work for the project.

GENERAL GUIDELINES

1.1 Referenced Standards
- A. LEED for Schools Credit EAp.1 and EAc3
- B. ASHRAE Guideline 0 - 2005
- C. ASHRAE Guideline 1.1 - 2007

1.2 Related Documents

A. Owner Project Requirements (OPR), Basis of Design (BOD), Construction Drawings and Specifications, LEED documentation, Provisions of the Commissioning Services Contract, including General Conditions and Requirements, Supplementary Conditions, Revisions and other Specification sections, apply to work in this section.

1.3 Definitions

School District (SD or Owner)
Ohio School Facilities Commission (OSFC or Co-Owner)
Ohio School Design Manual (OSDM)
Architect/Engineering Firm (A/E)
Construction Manager (CM)
Commissioning (Cx)
Commissioning Authority (CxA)
Test and Balance (TAB)
Owner's Project Requirements (OPR)
Basis of Design (BoD)
United States Green Building Council (USGBC)
Design Team (A/E, CM)
Project Team (A/E, CM, Contractor, Owners)
LEED Accredited Professional (LEED-AP)
Commissioning Team (SD, OSFC, CxA, CM, HVAC contractor, ATC contractor, TAB contractor, electrical contractor, plumbing contractor, general contractor.)

1.4 General Work Included

A. This section describes the process for commissioning of the various building systems, defines the responsibilities for the Project Team, and outlines the duties of parties involved.

B. The commissioning process may be applied to all equipment, components, and systems to be commissioned as listed in Part 3 of this section, including specified interfaces to and from equipment and systems provided under the other Divisions of this Specification.

C. LEED for Schools EAp1 - Fundamental Cx- INTENT: Verify that the building's energy-related systems are installed, calibrated, and perform according to the Owner's Project Requirements, Basis of Design, and Construction Documents.

D. LEED for Schools EAcr3 - Enhanced Cx - INTENT: Begin the Cx process early during the design process and execute additional activities after systems performance verification is completed.

1.5 Commissioning Authority

A. The CxA shall confirm that major building systems in newly completed school facilities are good operational systems that are low on maintenance and operating costs and perform interactively according to the contract documents.

B. Basic Services provided by the CxA are defined as services starting in the design phase through the warranty phase and include seasonal Cx. The CxA shall review design documents per LEED for Schools, develop a project specific Cx specification, develop and coordinate the execution of a testing plan, which includes observing and documenting system's performance to ensure that systems are functioning in accordance with the design intent of the contract documents and School District objectives.

C. The CxA will conduct and document commissioning meetings.

D. The CxA is not responsible for design or general construction scheduling, cost estimating, construction management, or performing corrective work, but shall assist with problem solving or addressing non conformance issues or deficiencies as identified by the CxA.

E. (Spec Writer Note: Identify the CxA hired by the School District to act as the CxA for the project and insert into this paragraph.) The CxA is responsible to the owner and shall have the authority to recommend final acceptance of each system commissioned.

1.6 Design Team (A/E and CM)

A. A/E will prepare the BoD and the construction documents per the OPR and the OSDM. This information must be submitted to the CxA for review.

B. A/E is responsible for the LEED process for the project.

C. A/E shall respond to the commissioning issues log.

D. The CM shall attend the commissioning meeting.

E. The CM shall prepare the Indoor Air Quality (IAQ) plan to be reviewed by the CxA per LEED for Schools EQc3.

1.7 Contractors

A. The appropriate contractors shall be responsible for cooperating and coordinating their work during the commissioning process. They shall be responsible for performing all work required for the installation of the components and systems, and for operation during the commissioning process. They shall furnish all necessary resources to accomplish the installation and the commissioning.

B. Within 30 days of the award of Contract, the Contractor shall submit the names of all the trades people who will be part of the commissioning process. The Contractor, and all his sub-trades and suppliers, shall cooperate with the CxA in the commissioning process.

C. At the initial commissioning scope meeting, to be held within 90 days of contract award, the contractor shall review the project schedule and identify the milestone commissioning activities. Milestone commissioning activities shall include, but are not limited to; equipment start-ups, system start-ups, testing activities performed by the contractor, readiness of each major system, and system functional testing as part of the commissioning process.

D. Contractor shall attend commissioning meetings, and complete action items arising from them, as required to allow the commissioning process to proceed on schedule.

E. Contractor shall complete and provide all system readiness documentation required by the commissioning process.

F. Contractor shall provide a Start-up Plan for each piece of equipment and system that is identified to be commissioned. Notify the CxA a minimum of seven (7) calendar days before start-up of major equipment and systems.

G. Contractors shall perform functional performance testing as specified in the CxA functional performance testing procedures.

H. Contractor shall provide personnel and testing instrumentation required to operate and test equipment and systems as part of functional performance testing. Testing may include calibration verification of system devices. Testing shall take place under the direct supervision of the CxA. Contractor shall be responsible for reimbursing the Owner and CxA for costs associated with retesting of systems that fail initial testing.

1.8 Commissioning Documentation

A. Commissioning Plan - Created by the CxA during the design phase of the project to identify scope of commissioning for the project and a preliminary schedule of activities for use during the project by members of the Commissioning Team.

B. Commissioning Specification – Created by the CxA during the design phase of the project to be inserted into the construction documents. Specification shall include a sample test form for all major equipment.

C. Meeting Minutes – Issued to members of the Commissioning Team after each commissioning progress meeting. Generated by the CxA.

D. Commissioning Schedule – Produced by the CxA with the input from the CM and the Commissioning Team contractors.

E. Design Phase documents – A/E will define the design intent for the Owner and for establishment of a basis for the Cx process. CxA will perform a design peer review report of the Owner's project requirements (OPR), Basis of Design (BoD), MEP Design Documents and the energy model. All documentation must be in compliance with LEED for Schools Credit EAc3 at each phased submission.

F. Start-up Plan – Submitted by the Contractor to identify methods to be used for equipment pre-checks, start-up procedures, start-up schedule, and sample reports to document completion. The Contractor shall document all equipment deficiencies and corrections made in the field as part of start-up report. Gather all appropriate utility information.

G. Envelope Testing Plan – CxA shall develop a envelope testing plan, schedule and reports. Schedule shall be coordinated with the CM and contractors.

H. Construction Phase documents – CxA shall provide a peer review and any comments on shop drawings to the designer of record. The CxA shall perform a peer review of the As-built documents at the end of the project.

I. Test Reports – Reports generated by the Contactor to document system/equipment testing included in the contact that is not dictated by the CxA. (i.e. hydrostatic pipe test report, pipe flushing & disinfection report, air & water balance report, etc.) CxA shall provide a review of these test reports.

J. Commissioning Issues Log – Identifies system deficiencies found through the commissioning process, updated and issued by the CxA.

K. Functional Tests – Created by the CxA, reviewed by the Project Team and the Commissioning Team contractors, for use during functional testing of each system. Test shall incorporate the Engineers sequence of control.

L. Training Plan – Submitted by the Contractor identifying personnel providing training and their qualifications, training supplemental materials and training session agendas for review by the CxA. Operation and maintenance manuals and as-builts shall be submitted to the CxA and the A/E to ensure completeness.

M. Systems Manual – CxA shall compile the System Manual for the owner. System manual shall consist of the OPR, design narrative and BOD (by A/E), CxA narrative, performance metrics for pre design (by A/E), control drawings (ATC), table of setpoints (by A/E and ATC), energy saving strategies (by A/E), As-Built drawings (CM, A/E and contractor), re-commissioning plan and energy tracking recommendations.

N. Final Commissioning Report – Provided by the CxA summarizing results, status of remaining operating deficiencies, and future actions and nonactions.

O. Re-commissioning manual – Provide by the CxA to identify a re-commissioning plan in compliance with LEED Eac3.

P. Commissioning Complete document– Formal Cx Project Complete document with sign-off to add finality to project.

Q. Post-Acceptance Phase documents – CxA will provide a near-warranty-end review of commissioned equipment. CxA will participate in a project close-out meeting / walk-thru with the construction team near the end of the warranty period to review and provide updates of any remaining construction issues. CxA will provide a letter report, summarizing the status of any remaining construction issues after conducting this “End of Warranty Period” walk-thru.

1.9 Testing Equipment & Instrumentation

A. The Contractor shall provide all industry standard test equipment required for performing the specified tests. Any proprietary vendor specific test equipment shall be provided by that vendor or manufacturer.

B. Any portable or hand-held setup / calibration devices required to initialize the control system shall be made available by the control subcontractor at no cost to the CxA or Owner for use during functional testing or pre-check inspections.

C. The Contractor's instrumentation shall be of sufficient quality and accuracy to test and/or measure system performance within the tolerances required. Instrumentation shall be calibrated at the manufacturer's recommendation intervals with calibration tags permanently affixed to the instrument. Instrumentation shall be maintained in good repair and operating condition throughout the duration of use on this project and shall be immediately re-calibrated or repaired if dropped and/or damaged in any way during use on the project.

1.10 Direct Digital Control System Software & Hardware

A. The Automatic Temperature Control Contractor shall provide the CxA full access to the Direct Digital Control system at the start of the acceptance phase.

B. System Software – The ATC Contractor shall provide the CxA with a copy of the system software and programming manual, including all diagnostic and trouble shooting features with license good for use during the project warrantee period. The ATC Sub-contractor shall provide the CxA training to allow navigation of the program. The security access should limit the CxAs ability to modify programming and only provide setpoint adjustment access, although does allow viewing of all system parameters and programming.

1.11 Commissioning Process

A. General: The commissioning process depends upon proper coordination between all Commissioning Team members, strict adherence to schedule and completion of all required documentation. Responsibilities of each team member are described in this and other sections of the contract.

B. Pre-Construction Phase

1. Initial Input: CxA shall attend POR meeting with Design Team to review project scope. A/E shall have an eco-charrette meeting where the CxA, CM, and Owner provide input. No later than the Design Development Phase, the Design Engineer shall submit the BOD Design Intent, Energy Model, Sequence of Operation, and Design Drawings to the CxA for review and comment. The CxA design review will follow LEED for Schools.

2. Preplanning: CxA will assist the A/E and CM in having the necessary commissioning language added to the bid documents and contractor requirements. CxA will work with the CM in adding the commissioning process into the project planning timeline and establish commissioning milestones.

C. Construction Phase

1. Commissioning Meetings: An initial Commissioning Scope Review/kick-off meeting will be held with all members of the Commissioning Team at the beginning of the project (generally within 90 days of award of contract). Periodic Commissioning Team progress meetings will be scheduled by the CxA to review progress of commissioning work and coordinate activities. (Commissioning progress meetings will be scheduled to coincide immediately before or after the regular weekly construction progress meeting.) Contractor shall anticipate at least one (1) commissioning meeting for every month of the construction phase (additional meetings as required will not be considered additional work to this contract).
2. Commissioning Schedule: Contractor shall assist the CxA in the development of a written schedule that integrates the commissioning activities into the construction schedule specified in Division 1. Update of the commissioning schedule to reflect changes in the work will be done as necessary. The commissioning schedule shall include at least the following dates:
   a. Submission of Operation & Maintenance information for systems to be commissioned.
   b. Schedule for systems, subsystems, and equipment start-up, including services of manufacturers' authorized service representatives, and performance of pretest checks.
   c. Schedule for functional performance testing, including seasonal testing.
   d. Schedule for Building Envelope testing.
   e. Schedule for Owner's operating personnel training.
3. Equipment & System Start-Up: Before any equipment or system is started, the Start-up Plan, including all pre-start check documentation provided by the equipment manufacturer, must be submitted. A minimum of seven (7) days prior to the start-up, the contractor shall notify the CxA of the scheduled start-up and give the CA the opportunity to witness part or all of the start-up work, and conduct their own pre-check inspection. After start-up is completed, then contractor shall submit completed start up report for each piece of equipment.
4. Prerequisite to Commissioning: Test and Balance report must be signed off by the Designer of record prior to final Cx of the respective systems. The CxA will observe, witness, and verify the TAB work in progress as necessary and correct. It is expected that all relevant and known punch-list items are addressed prior to that agenda Cx activity.
5. Initial Operation: Once the Contractor completes the start-up, testing, balancing, and calibration of all components and systems, the Contractor shall operate all systems through the specified modes of operation, and test the system responses to specified abnormal or emergency conditions. It is the responsibility of the contractor to complete the system and perform this functional and performance pre-check before the commissioning team performs functional acceptance testing.
   a. Functional acceptance testing included in the commissioning process is verification that the contractor has provided a complete and functioning system per the contract requirements. It is <u>not</u>, an opportunity for the contractor to determine deficiencies and work remaining.

b. The contractor shall ensure that a qualified technician(s) is available and present during the agreed upon schedules and of sufficient duration to complete the necessary tasks, tests, adjustments, and/or problem resolution.

c. Functional testing of the system shall be terminated and re-scheduled if it is deemed by the CxA that the system is not ready for functional testing and that the contractor has not fully completed the required initial operation pre-check. Costs borne by the Owner, CxA, Construction Manager and Associates associated with the additional time and resources required to re-schedule and repeat testing due to a lack of system readiness by the contractor, shall be borne by the contractor.

D. Acceptance Phase

1. Functional Acceptance Testing: Systems identified for commissioning shall be operated through the entire specified sequence of operations, as directed by the CxA for verifying acceptable operation. The contractor shall provide all testing instrumentation required and operate the system during the tests, and by this, the contractor shall ensure that the systems are not operated beyond their limits as installed.

2. System Deficiencies: All system operational deficiencies identified during the functional acceptance testing will be recorded by the CxA for correction by the contractor. Work to correct the deficiencies will be under the direction of the Owner, the Owner's representative, or the Project CM. Final acceptance of the system shall not be granted until all deficiencies identified are corrected or accepted.

E. Post-Acceptance Phase

1. CxA will provide a near-warranty-end review of commissioned equipment. CxA will participate in a project close-out meeting / walk-thru with the construction team near the end of the warranty period to review and provide updates of any remaining construction issues. CxA will provide a letter report, summarizing the status of any remaining construction issues after conducting this "End of Warranty Period" walk-thru.

1.12 System(s)/Equipment to be Commissioned

Spec Writer Note: Coordinate with the CxA and Owner which systems are to be commissioned for the project. HVAC systems and components listed are to be included in the basic project scope of work, although commissioning of additional building systems may also be added as an Owner's option.

A. The following systems shall be commissioned:

1. HVAC Systems including:

a. Direct digital automatic temperature control system (building automation systems)

b. Air distribution systems (air handling units, VAV boxes, make-up air units, etc.)

c. Hot water heating system (including boiler(s), pumps)

d. Chilled water system (including chiller(s), pumps)

e. Exhaust systems

f. Unitary systems (heat pump units & unit heaters)

g. Variable frequency drives

h. Cooling towers

i. Hydronic systems

j. Electrical heating systems
k. Utility service to HVAC systems
l. Energy consumption
M. HVAC Equipment Noise

2. Electrical Contractor Systems including:
   a. Normal Power Distribution (Main to Sub-Panel)
   b. Emergency Power System
   c. Alternative Energy Systems
   d. Lighting and lighting control
3. Plumbing Contractor Systems including:
   a. Domestic Hot Water
4. General Contractor Systems including:
   a. Classroom Acoustics per OSDM
   b. Building Envelope
   c. Kitchen Refrigerant Systems

B. The following equipment shall be provided a formal start-up (refer to other sections of the project specification for additional start-up requirements):
   1. HVAC Equipment including:
      a. Air Handling Units
      b. Boilers
      c. Pumps
      d. Chillers
      e. Fans
      f. Unitary Equipment
      g. Generator and Transfer Switches

END OF SECTION

02 DIVISION

EXISTING CONDITIONS

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DIVISION 02: EXISTING CONDITIONS

024116	Structural Demolition
024119	***Selective Structural Demolition***
025000	Site Remediation

SECTION 024116

STRUCTURAL DEMOLITION

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for demolition and removal of buildings and site improvements.

1.2 QUALITY ASSURANCE

A. Quality Standard: ANSI A10.6 and NFPA 241.

1.3 EXAMINATION

A. Perform an engineering survey of condition of building.

1.4 DEMOLITION

A. Use of explosives is not permitted.

B. Below-Grade Construction: Demolish and completely remove materials within 5 feet of new building footprint.
   1. Remove to at least 12 inches below grade all material outside of building footprint.

C. Existing Utilities: Demolish within 5 feet of new/existing building footprint and abandon outside footprint.

1.5 SITE RESTORATION

A. Below-Grade Areas: Fill and rough grade.
   1. Fill with satisfactory soil materials, recycled pulverized concrete, or recycled pulverized masonry per Geotechnical Engineer's recommendation.

1.6 DISPOSAL OF DEMOLISHED MATERIAL

A. Remove demolished material from site that cannot be salvaged or recycled and dispose of in an EPA-approved landfill.

B. Burning: Not Permitted.

LEED SUGGESTIONS

2.1 Coordinate with goals for "Construction Waste Management" to divert demolition debris from landfills. Identify and document materials that can be recycled. Identify and document materials to be salvaged for reuse either on site or off site.

LESSONS LEARNED

3.1 If over one acre of site is disturbed outside of building footprint, the School District must apply for a Notice of Intent (NOI) for Coverage under Ohio Environmental Protection Agency General Permit. Comply with local authorities who have jurisdiction requirements.

END OF SECTION

SECTION 024119

SELECTIVE STRUCTURE DEMOLITION

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for demolition and removal of portions of a building or structure and selected site elements.

1. Salvage existing items that can be reused or recycled.

1.2 EXECUTION

A. Professional engineer engaged to survey condition of building.

1.3 DISPOSAL OF DEMOLISHED MATERIAL

A. Remove demolished material from site that cannot be salvaged or recycled and dispose of in an EPA-approved landfill.

LEED SUGGESTIONS

2.1 Large portions of existing structures that can be reused on a major renovation project may qualify for a LEED for Schools Materials and Resources, Building Reuse Credit. Design Professionals are encouraged to pursue these credits where possible.

2.2 Coordinate with Construction Waste Management Plan. Identify materials to be recycled. Identify materials to be salvaged for reuse either on site or off site.

LESSONS LEARNED

3.1 What is to be demolished and what is to remain should be clearly indicated on the Drawings. Distinguish between what is to be demolished and discarded, and what is to be reinstalled, salvaged, or protected.

3.2 If selective demolition involves the exterior walls or roof of a building, temporary enclosures need to be weather-tight and strong enough to withstand winds. Airborne particles and dust generated by selective demolition activities may also be of concern to occupants of other spaces in the building. The following requirements can also be added to the Section Text for selective demolition locations near occupied areas where dust and other possible pollutants may be an issue:

A. Provide a vestibule enclosure at the entrance to the selective demolition area to create an airlock and suiting-up area.

B. Specify access routes for equipment and personnel and removal routes for selection demolition debris to areas outside the building; use sealed transport containers in corridors.

C. Provide exhaust systems to filter out and expel dust and airborne contaminants from the selective demolition enclosure directly to the outside. Design the system to provide negative air pressure in the selective demolition area relative to the adjacent spaces. The system can be designed and shown on the Drawings or the Contractor can be required to design the system to meet specific criteria.

D. Provide replacement-air (makeup air) systems to condition and filter air to replace exhausted air.

E. Clean and treat duct interiors with antifungal and antiviral agents after selective demolition is complete.

END OF SECTION

SECTION 025000

SITE REMEDIATION

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. ***Qualitative requirements for*** sampling and analysis of, remediation technologies for, and removal and disposal of contaminated materials.

1.2 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with governing EPA regulations. Comply with hauling and disposal regulations of authorities having jurisdiction.
   1. Under Environmental Protection Agency (EPA) National Emission Standards for Hazardous Air Pollutants (NESHAP), Category I, nonfriable asbestos-containing materials (ACM) are not considered regulated ACM and need not be removed prior to demolition work where standard demolition procedures and equipment are utilized.
   2. Category II nonfriable asbestos-containing materials (ACM) are considered regulated ACM if demolition operations cause these materials to become crumbled, pulverized, or otherwise reduced to powder.
   3. Friable asbestos-containing materials (ACM) are also regulated ACM.
   4. If quantity of regulated ACM associated with demolition work of any given project exceeds EPA's threshold amounts, regulated ACM must be removed prior to demolition and disposed at an EPA-approved landfill.

1.3 PROJECT CONDITIONS

A. EPA must be notified at least two weeks in advance of any demolition work; presence and quantity of ACM that will remain in building must be recorded on this notification.

B. Occupational Safety and Health Administration (OSHA) Standards require implementation of appropriate engineering controls and work practices for demolition work where there is any quantity of asbestos-containing materials (ACM) present.

C. Ohio Department of Health (ODH) does not regulate demolition work. However, if removal of ACM is required prior to demolition, ODH requirements apply. ODH regulations require that credentialed and licensed personnel be used for asbestos-related work. If quantity of ACM to be removed as part of any given project exceeds ODH's threshold amounts then ODH must be notified of such work at least two weeks in advance of its commencement.

D. If waste consolidation and recycling methods will be utilized, if any portion of a building or its demolished components will be intentionally burned, or if any ACM will be subject to sanding, grinding, or abrading, then Category I nonfriable ACM shall be regulated. Therefore, if any of these methods will be used during the demolition process, ACM subject to these work practice should be removed prior to start of demolition work. Additionally, if ACM will be salvaged or removed prior to start of demolition by the Contractor, all applicable OSHA, EPA, and ODH regulations apply.

END OF SECTION

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03 DIVISION

CONCRETE

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DIVISION 3: CONCRETE

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033000	***Cast-in-Place Concrete***
033510	***Polished Concrete Finishing***
033519	***Colored Concrete Finishing***
034100	Precast Structural Concrete
034500	Precast Architectural Concrete
035113	Cementitious Wood Fiber Decks
035216	Lightweight Insulating Concrete

SECTION 031119

INSULATING CONCRETE FORMING

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for an insulated concrete wall forming system. It is an expanded polystyrene concrete forming unit which is used to construct a monolithic reinforced concrete wall. The forms remain in place providing an energy efficient concrete wall and it is finished with conventional interior and exterior wall coverings.

1.2 MATERIALS

A. Expanded Polystyrene: ASTM C 578.

B. Cross Ties: Polypropylene.

C. Concrete and Steel Reinforcement: Refer to Section 033000 – Cast-in-Place Concrete.
   1. Compressive Strength: 3000 psi minimum.
   2. Slump: 4 to 6 inches.

1.3 ACCESSORIES

A. Bracing, wall alignment, and scaffolding.

B. Window and door bucks.

C. Bearing plates and rim joist brackets or anchors.

D. Anchor bolts and plate anchors.

E. Waterproofing for below grade applications. ***Refer to 071000 – Dampproofing and Waterproofing.***

F. Exterior Finishes: Refer to Section 042000 – Unit Masonry.

G. Interior Finishes: Must meet 15 minute thermal barrier requirements. Refer to Section 092116 – Gypsum Board Assemblies.

LESSONS LEARNED

2.1 Wall can achieve an R-value of greater than 20. Thermal comfort combined with thermal mass advantages yields potential energy savings.

2.2 Sound Attenuation can achieve an STC of 50 when a 6 inch core is used.

2.3 Fire Resistive Construction: Up to 4 hours can be obtained.

2.4 Storm Safe Occupancy: System can be reinforced to sustain wind loads in excess of 150 miles per hour.

END OF SECTION

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SECTION 033000

CAST-IN-PLACE CONCRETE

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for curing, standard finishing, cements, aggregates, plasticizers and other chemical admixtures, additives, hardeners, and concrete reinforcement.

1.2 QUALITY ASSURANCE

A. Quality Standard: ACI 301.

1.3 REINFORCEMENT MATERIALS

A. Reinforcing Bars: Deformed or low-alloy steel.

B. Welded Wire Fabric (WWF): Plain.

C. Fibrous Reinforcement: (Optional) Fibrous reinforcement may be used in addition to welded wire fabric for concrete toppings and interior and exterior slabs on grade, whether exposed or covered with a floor covering. Use only fibrous reinforcement in precast concrete plank topping.
1. Not to be used as a substitute for primary reinforcement for composite and non-composite elevated slabs or for interior or exterior slabs on grade.

D. Carbon Steel Fibers:
1. Carbon steel fibers may be used in concrete for slabs on grade in lieu of welded wire fabric and fibrous reinforcement, at a rate of 30 lbs/cu.yd. of concrete.
2. Carbon steel fibers may not be used in concrete for elevated slabs on non-composite deck or steel centering in lieu of welded wire fabric and fibrous reinforcement.
3. Carbon steel fibers may be used in concrete for elevated slabs on composite metal deck at a rate of 35 lbs. per cubic yard of concrete.

E. Structural Macro Fibers:
1. Structural macro fibers may be used in concrete for slabs on grade in lieu of welded wire fabric and fibrous reinforcement at a rate of 4 lbs. per cubic yard of concrete.
2. Structural macro fibers may be used in concrete for elevated slabs on composite metal deck at a rate of 4.5 lbs. per cubic yard of concrete.
3. Structural macro fibers may not be used in concrete for elevated slabs on non-composite metal deck.

1.4 CONCRETE MATERIALS

A. Portland Cement: ASTM C150, Type I, ***II,*** or III.

B. Supplementary Cementitous Materials:
1. Fly Ash: May be used up to a maximum of 25% of the total cementitous materials content in all concrete mixes.
2. Ground Granulated Blast-Furnace Slag: May be used up to a maximum of 35% of the total cementitous material content in all concrete mixes.

C. Aggregates
1. ASTM C33, Class 3S, normal weight aggregates.
2. ASTM C330, light weight aggregates.

D. Water: Potable, ASTM C94.

E. Concrete Admixtures: Containing less than 0.1 percent chloride ions.
1. Water-Reducing Admixture: Type A.
2. ***Retarding Admixture, Type B.***
3. High-Range Water-Reducing Admixture, Type F.
4. Water-Reducing, Accelerating Admixture: Type E.
5. Water-Reducing, Retarding Admixture, Type D.
6. ***Accelerating Admixtures: Type C.***

F. Vapor Retarder:
1. ASTM E-1745; meets or exceeds Class B, Water Vapor Permeance (ASTM E-96): 0.025 gr./ft^2/hr. or lower.

G. Concrete Curing ***Methods***
1. ***Keep concrete continuously wet***.
2. ***Covering concrete with mats.***
3. ***Covering concrete with impervious sheet.***
4. Liquid Membrane-Forming Curing Compound: ***Clear, waterborne,*** membrane-forming curing, dissipating.
5. Provide for concrete floors that are to receive applied finished floor materials.

H. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound:
1. Can be applied to floor not scheduled to receive a finish.

1.5 PROPORTIONING AND DESIGN OF MIXES

A. Proportion mixes by either laboratory trial batch or field experience methods as specified in ACI 301, using materials to be employed on the project for each class of concrete required.

B. Water/Cementitious Ratios: Concrete mixes shall be limited to the water/cementitious ratios specified in the Concrete Schedule.

1.6 ***FLOOR AND SLAB*** FINISHES

A. Float Finish (Flt-Fn) - ***Noncritical Floors:***
1. Specified Overall Value: ***FF 20/FL 15***.
2. Minimum Local Value: ***FF 15/FL 10***.
3. ***Apply float finish to monolithic slab surfaces that are to receive trowel finish and subfloors under concrete toppings, thickset tile, sand bed terrazzo, and raised computer floors.***

B. Trowel Finish 1 (Tr-Fn1) – ***Carpeted Floors, unless otherwise noted.***
1. Specified Overall Value: ***FF 25/FL 20.***
2. Minimum Local Value: ***FF 17/FL 15.***
3. ***Apply trowel finish to monolithic slab surfaces that are to receive carpet and noncritical floors where slabs remain exposed, such as mechanical rooms, unless otherwise noted.***

C. Trowel Finish 2 (Tr-Fn2) – ***Floors with improved flatness/levelness requirements.***
1. Specified Overall Value: ***FF 35***/FL 25.
2. Minimum Local Value: ***FF 24/FL 17***.
3. ***Apply trowel finish to monolithic slab surfaces that are to receive thin-set flooring, resilient flooring, linoleum flooring, fluid-applied flooring, resinous flooring and other flooring types, unless otherwise indicated.***
   a. At thin-set tile floors, maximum permissible variation shall be ¼ inch to 10 feet from required plane. After surface is steel troweled, apply a fine broom finish.

D. Trowel Finish 3 (Tr-Fn3) – ***Floors requiring better than average flatness/levelness.***
1. Specified Overall Value: FF 45/FL 35.
2. Minimum Local Value: FF 35/FL 24.
3. Apply trowel finish to monolithic slab surfaces that are scheduled to receive a polished concrete finish, unless otherwise noted.

E. ***Trowel Finish 4 (Tr-Fn4) – Wood covered floors, and with other floor finishes as indicated in their technical sections and required by their manufacturers:***
1. The slab shall be steel troweled to a true level and finished smooth and straight to a tolerance of 1/8inch in any 10 foot radius.

F. Nonslip Broom Finish (NsBrm-Fn): Apply nonslip broom finish to exterior concrete platforms, steps and ramps, ***and elsewhere as indicated.***
1. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber bristle broom, perpendicular to main traffic route. ***Coordinate required final finish with the A/E before application.***

G. Elevated slabs shall have a specified overall value of ***FF 30*** and a minimum local of ***FF 24 with FL 20 with minimum local value of FL 15.***

LEED SUGGESTIONS

2.1 LEED for Schools includes credits for materials extracted/harvested and manufactured within a 500 mile radius from the project site. Concrete ready mix plants are so numerous that they are generally within 50 miles of most job sites. Supplementary cementitious materials, Portland cement, and the raw materials for cement are also generally extracted and manufactured within 500 miles of a job site as well.

2.2 Most reinforcing steel in the U.S. is manufactured from recycled steel. Steel from the Electric Arc Furnace (EAF) process contains a total of 100 percent recovered steel, of which 67 percent is post-consumer.

2.3 Supplementary cementitious material such as fly ash and slag cement are typically considered pre-consumer recycled material.

LESSONS LEARNED

3.1 Fly ash may improve workability, cohesiveness, and pumpability of fresh concrete and reduce concrete permeability with corresponding improvement in durability.

3.2 Fiber reinforcement may be used when plastic shrinkage reduction is sought.

3.3 Vapor Retarder is to be used directly below slab-on-grade.

(please see chart on next page)

C O N C R E T E S C H E D U L E

(The following are minimum design values)

ITEM OR STRUCTURE	FINISH	COMPRESSIVE STRENGTH AND OTHER REQUIREMENTS
Concrete not otherwise indicated and suspended slabs	RfFm-Fn SmFm-Fn, if exposed	3500 P.S.I. at 28 days Normal Weight Concrete: Minimum Cementitious Material Content: ACI minimum requirements Lightweight Concrete: Calculated Equilibrium Unit Weight: 110 lb/cu.ft, plus or minus 5 lb/cu.ft. per ASTM C567
Trench footings, footings, and interior foundations and retaining walls	RfFm-Fn SmFm-Fn, if exposed	3000 P.S.I. at 28 days
Foundation and retaining walls exposed to exterior	RfFm-Fn SmFm-Fn, if exposed	4000 P.S.I. at 28 days 4.5% - 7.5% air entrainment Max W/C Ratio = 0.45 Mid-Range Water Reducer Required
Interior formed concrete exposed to view	SmFm-Fn	4000 P.S.I. at 28 days
Interior floor slabs scheduled to receive mud-set mosaic and quarry tile	Flt-Fn	3500 P.S.I. at 28 days Max W/C Ratio = 0.45 Mid-Range Water Reducer Required
Flowable fill – Type I Utility Trench Backfill	--	50-100 PSI at 28 days Unconfined compression strength per ASTM D4832
Lean concrete fill at soft soils or over excavations (option)	--	1500 P.S.I. at 28 days
Flowable fill – Type II (option) Under Foundations	--	85 PSI at 28 days Unconfined compression strength per ASTM D4832
Metal stair pan fill, toppings over precast deck	--	2500 P.S.I. at 28 days #8 Aggregate (maximum)
Exposed interior floor slabs and interior slabs scheduled to receive ***carpet***	***Tr-Fn1***	3500 P.S.I. at 28 days Max W/C Ratio = 0.45 Mid-Range Water Reducer Required
Exterior walks, stoops, steps, aprons, and curbs; exterior formed concrete exposed to view; exterior concrete not otherwise indicated	NsBrm-Fn Grt-Cl-Fn	4000 P.S.I. at 28 days 4.5% - 7.5% entrainment Max W/C Ratio = ***0.50***
Interior floor slabs scheduled to receive thin-set flooring, resilient flooring and other flooring types, unless otherwise noted	***Tr-Fn2***	***3500 P.S.I. at 28 days*** ***Max W/C Ratio = 0.45*** ***Mid-range water reducer***
Interior floor slabs scheduled to receive a polished surface, and where indicated	***Tr-Fn3***	***3500 P.S.I. at 28 days*** ***Max W/C Ratio = 0.45*** ***Mid-range water reducer***
Interior floor slabs scheduled to receive wood flooring, and where indicated	***Tr-Fn4***	***3500 P.S.I. at 28 days*** ***Max W/C Ratio = 0.45*** ***Mid-range water reducer***

END OF SECTION

SECTION ***033510***
POLISHED CONCRETE FINISHING

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. This Section covers the performance characteristics and application procedures for polishing of concrete. The process involves grinding and buffing concrete surface to provide a sheen. Application of a liquid densifier provides a non-dusting surface resistant to surface absorption of liquids.

1.2 POLISHING MATERIALS

A. Liquid Densifier: Chemically reactive, waterborne solution of inorganic silicate or siliconate materials; odorless; colorless which hardens and densifies concrete surfaces to protect against abrasion, dusting, and absorption of liquids.

B. Joint Fillers: Two (2) component, 100 percent solids compound, with a minimum Shore D hardness of 50.

C. Color (Optional): Ready to use, penetrating, dye or reactive stain that chemically combines with cured concrete to produce permanent, variegated or translucent color effects or a hydrolyzed, lithium quartz or silicate compound, that works by penetrating and reacting with mineral compounds and/or siliceous materials to create a translucent or marbled color effects.

D. Polishing Equipment

1.3 POLISHED CONCRETE APPLICATION

A. Grind the concrete floor to within 2 to 3 inches of walls or obstructions with 16, 25, 40, 60, 80, and/or 150 grit, removing construction debris.

B. Apply material for color effects (optional).

C. Apply liquid densifier.

D. Polish the floor to desired sheen level.

E. Edges may be painted, honed, or polished.

LESSONS LEARNED

3.1 Polished concrete is gaining popularity as a moderate-duty concrete floor that is low maintenance and environmentally-friendly. Diamond polishing technology adapted from the dimension stone industry is used to produce a concrete floor with moderate to high-gloss shine.

A. Polished concrete is considered an environmentally-friendly choice for hard-surfaced flooring, eliminating resilient floor coverings, adhesives, sealers, and waxes that contain VOCs. The low-maintenance finish requires only regular damp mopping and occasional light polishing to restore gloss, without the need for periodic waxing, stripping, or chemical cleaning. Furthermore, the high reflectivity of the surface can reduce the amount of artificial lighting required to achieve a given level of illumination.

B. Existing concrete flat work also can be polished following patching and crack repair as required to produce a sound surface.

END OF SECTION

SECTION 033519

COLORED CONCRETE FINISHING

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for chemically staining and sealing ***(or just sealing)*** concrete flatwork.

1.2 POLISHING MATERIALS

A. Liquid Densifier (optional): Chemically reactive, waterborne solution of inorganic silicate or siliconate materials; odorless; colorless which hardens and densifies concrete surfaces to protect against abrasion, dusting, and absorption of liquids.

B. Joint Fillers: Two (2) component, 100 percent solids compound, with a minimum Shore D hardness of 50.

C. Color ***(optional)***: Ready to use, penetrating, dye or reactive stain that chemically combines with cured concrete to produce permanent, variegated or translucent color effects or a hydrolyzed, lithium quartz or silicate compound, that works by penetrating and reacting with mineral compounds and/or siliceous materials to create a translucent or marbled color effects.

D. Sealer: Water based acrylic for sealing concrete where regular maintenance is planned. ***Designed to repel water, reduce scuffing and marring, allows substrate to breath, and produces a shine.***

1. Sealer shall be compatible with stain where stain is used.

END OF SECTION

SECTION 034100

PRECAST STRUCTURAL CONCRETE

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for precast reinforced concrete units.
   1. Plant-cast, load bearing, double-wythe, insulated, structural precast concrete units with an architectural finish for use as exterior building envelope and structural elements.
   2. Hollow-core slab and long-span plant-cast structural concrete units.

1.2 QUALITY ASSURANCE

A. Design Standard: PCI MNL 120

B. Quality-Control Standard: PCI MNL 116

1.3 MATERIALS

A. ***Form Liners (option)***

B. Reinforcing Materials
   1. Reinforcing Bars: Deformed, deformed low-alloy, or galvanized steel.
   2. Steel Bar Mats***: Steel or low-alloy steel.***
   3. Welded Wire ***Reinforcement***: Plain or deformed steel.

C. Prestressing ***Tendons***

D. Concrete Materials
   1. Portland Cement: ASTM C ***150***, Type I or III.
   2. Normal-Weight Aggregates: Except as modified by PCI MNL 116, ASTM C 33, with coarse aggregates complying with Class 4S.
   3. Admixtures: As recommended by ***Design Professional***, unless otherwise noted.
   4. ***Supplementary Cementitious Materials:***
      a. Fly Ash may be substituted for up to 20 percent of the total cementitious materials.
      b. ***Ground granulated blast-furnace slag may be substituted for up to 50% of the total cementitious materials.***

E. Steel Connections
   1. Finish: Painted, interior and galvanized for item in exterior wall or exposed to humidity above 50 percent.

F. Bearing Pads: As selected by Design Professional.

G. Rigid Insulation for Concrete Sandwich Panels: Extruded polystyrene rigid board.

H. Wythe Connectors for concrete sandwich panels: non-conductive, corrosion and alkali resistant, fiber composite wythe connectors, notched for retention.

I. Thin and half brick units and accessories.

J. ***Latex-portland cement pointing grout for thin-brick-unit joints.***

1.4 CONCRETE MIX

A. Compressive Strength (28 days): Normal-Weight Concrete: 5,000 psi

END OF SECTION

SECTION 034500

PRECAST ARCHITECTURAL CONCRETE

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for architectural precast units.

1.2 QUALITY ASSURANCE

A. Design Standard: PCI MNL 120.

B. Quality-Control Standard: PCI MNL 117.

1.3 MATERIALS

A. Reinforcing Materials
1. Reinforcing Bars: Steel.
2. Steel Bar Mats: Steel.
3. Welded Wire Reinforcement: Plain steel.

B. Prestressing Strands

C. Concrete Materials
1. Portland Cement: ASTM C 150, Type I or III.
2. Supplementary Cementitious Materials: Fly ash and/or ground granulated blast-furnace slag.
3. Aggregates: Normal weight or lightweight.
a) Face-Mixture Coarse Aggregates: Uniformly graded.
4. Coloring Admixture, if required by Design Professional.
5. Admixtures: As recommended by Design Professional.

D. Steel Connections: Carbon-steel shapes and plates.
1. Finish: Galvanized.

E. Bearing Pads: As selected by Design Professional.

F. Grout: Sand cement.

1.4 CONCRETE MIXTURES

A. Compressive Strength (28 days):
1. Normal-Weight Concrete Face and Backup Mixtures: 5000 psi

END OF SECTION

SECTION 035113

CEMENTITIOUS WOOD FIBER DECKS

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES
- A. Qualitative requirements for monolitic cementitious wood-fiber units for roof deck installation and subpurlin tees for tile decks.

1.2 MATERIALS
- A. Cementitious Wood-Fiber Units
  - 1. Composition: Chemically processed long wood fibers mixed with Inorganic Hydraulic Cement, pressure bonded to produce units of thicknesses and sizes indicated.

1.3 PRODUCTS
- A. ***Monlithic*** Cementitious Wood-Fiber Units
  - 1. Tile: 2 inch minimum thickness.
  - 2. Plank: 2 inch minimum thickness.
  - 3. Channel-Reinforced Panels: 2 inch minimum thickness.
  - 4. Concealed Tee Plank: 3 inch minimum thickness
- ***B. Composite Cementitious Wood-Fiber Units***
  - ***1. Composite Tile: 2 inch minimum thickness.***
  - ***2. Composite Plank: 2 inch minimum thickness.***
  - ***3. Composite Channel-Reinforcement Plank: 2 inch minimum thickness.***
- ***C. Insulated Composite Cementitious Wood-Fiber Units***
  - ***1. Insulated Composite Tile:***
    - ***a) Tile Base Thickness: 2 inch minimum.***
    - ***b) Insulation Thickness: Total thickness shall be as required to meet value established by Energy Modeling.***
    - ***c) Insulation: Extruded polystyrene.***
  - ***2. Insulated Composite Plank:***
    - ***a) Base Thickness: 2 inch minimum thickness.***
    - ***b) Insulation: Extruded polystyrene.***
    - ***c) Insulation Thickness: Total thickness shall be as required to meet value established by Energy Modeling.***
  - ***3. Insulated Composite Channel-Reinforced Plank:***
    - ***a) Base Thickness: 2 inch minimum thickness.***
    - ***b) Insulation: Extruded polystyrene.***
    - ***c) Insulation Thickness: Total thickness shall be as required to meet value established by Energy Modeling.***
- ***D.*** Subpurlins: Hot-rolled steel bulb tees
  - 1. Gypsum based grout should fill entire space between tile and bulb tee.

LEED SUGGESTIONS

2.1 Construction Waste Management: Products are typically cut to 1'-0" length increments at factory reducing or eliminating field cuts and waste at site. Products can be shipped without packaging for minimum site waste.

2.2 Certified Wood: Products can be FSC and SFI certified.

2.3 Regional Materials: Products are manufactured in Ohio.

END OF SECTION

SECTION 035216

LIGHTWEIGHT INSULATING CONCRETE

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for cast-in-place lightweight concrete roof insulation for roof decks.

1.2 MATERIALS

A. General: Low density concrete, with an oven-dry unit weight not exceeding 50 lb./cu.ft., placed with or without embedded rigid insulation (EPS). Material shall be composed of a slurry of cement, water, and expansion material to produce an insulating concrete of a specific density range.

B. Cement: Portland Cement.
1. Fly ash may be used up to 25 percent of Portland cement by weight.

C. Galvanized Plain-Steel Welded Wire Reinforcement.

D. Molded-Polystyrene Insulation Board.

1.3 PHYSICAL PROPERTIES

	Range II	Range III
Cast Density	34-42 pcf	42-50 pcf
Compressive Strength	200 psi	250 psi
Roof Membrane Type	nailed base sheet	fully adhered system

END OF SECTION

04 DIVISION

MASONRY

TABLE OF CONTENTS

DIVISION 04: MASONRY

042000 ***Unit Masonry***
042250 Autoclaved Aerated Concrete (AAC) Masonry
042700 Glass Masonry Units
047200 Cast Stone

SECTION 042000

UNIT MASONRY

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for unit masonry assemblies.
   1. Masonry mortar and mixing masonry assemblies.
   2. Masonry grout and mixing masonry grout.
   3. Masonry anchorage and reinforcement devices.
   4. Masonry accessories.
   5. Manufactured concrete masonry units; both loadbearing and nonloadbearing and intended for use in unit masonry assemblies with mortar.
      a. Concrete masonry units
      b. Sound absorbing concrete masonry units
      c. Sound diffusing concrete masonry units
      d. Decorative concrete masonry units
   6. Manufactured clay masonry units; both loadbearing and non-loadbearing.
      a. Brick
      b. Structural-Clay Facing Tile

1.2 QUALITY ASSURANCE

A. Masonry Standard: Comply with ACI 530.1 / ASCE 6 / TMS 602.

B. Protection of Masonry: During erection, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
   1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
   2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.

C. Mockups: Build mock-ups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials, execution, and aesthetic effect.
   1. Build mock-up of typical wall area(s) as shown on Drawings including Movement Control Joints (Sealant Filled) 1'4" (minimum length), Air Barrier, Blocking for Window, Horizontal and Vertical Reinforcing Shelf Angles and Supports, Bond Beams and Lintels, Brick Ties and Anchors Flashing, End Dams, Weeps and Vents, Cavity Drainage Material (if required), Window Head, Sill and Jamb Details.
      a. Include a sealant-filled joint at least 16 inches long in each exterior wall mock-up.
      b. Include lower corner of window opening at upper corner of exterior wall mock-up. Make opening approximately 12 inches wide by 16 inches high.
      c. Include through-wall flashing installed for a 24-inch length in corner of exterior wall mock-up approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).

2. Prior to starting general masonry cleaning, prepare mock-up for cleaning using the same cleaning materials and methods proposed for the Work.

3. Protect accepted mock-ups from the elements with weather-resistant membrane.

4. The construction of the mock-up shall be photographed or videotaped by the masonry contractor to be part of a presentation for groups of trades people as they join the project work force.

1.3 CONCRETE MASONRY UNITS

A. Concrete Masonry Units (CMU): Light weight, medium weight, or normal weight.

B. Concrete Building Brick

C. Sound Absorbing Concrete Masonry Unit (SACMU)
1. Face sizes, unit weights, and finish textures shall match those of required regular concrete masonry units.
2. Provide flared slots, metal septa, and incombustible fibrous cavity fillers of the following:
a. 8 inch (53 STC) and 12 inch (56 STC) thick walls.

D. Sound Diffusing Concrete Masonry Units (SDCMU)
1. Aggregate shall meet ASTM C90 and ASTM C129.

2. Fiberglass inserts shall be installed at the block plant to ensure proper positioning.
3. Sound Control
a. STC: 55
b. NRC: 0.40

E. Decorative Concrete Masonry Units: Light weight, medium weight, or normal weight.
1. Finish: Exposed faces of the following general description matching color, pattern, and texture of Architect's samples:
a. Normal-weight aggregate, ground finish (not acceptable if used as a comparison for LFI calculations)
b. Normal-weight aggregate, split-face finish
c. Normal-weight aggregate, split-ribbed finish
d. Normal-weight aggregate, standard finish, scored vertically so units laid in running bond appear as square units laid in stack bond
e. Normal-weight aggregate, standard finish, triple scored vertically so units laid in running bond appear as vertical units laid in stacked bond

F. Prefaced Concrete Masonry Units: Light weight hollow or solid units with smooth resinous facing.

G. Integral Water Repellent: Provide units made with liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength.

1.4 BRICK
A. Face Brick: ASTM C 216
1. Grade and Unit Compressive Strength: Provide units with grade indicated below:
a. Grade: SW., Type FBX or FBS

B. Building (Common) Brick: ASTM C 62 and as follows:
   1. Grade and Unit Compressive Strength: Provide units with grade indicated below:
      a. Grade: MW ***or SW.***
   2. Application: Use where brick is indicated for concealed locations.

1.5 STRUCTURAL-CLAY FACING TILE
A. Glazed Structural – Clay Facing Tile: ASTM C126, Grade S or SS.
B. Unglazed Structural – Clay Facing Tile: ASTM C212, Type FTX or FTS, Standard class.

1.6 STONE
A. Stone Trim Units: Limestone.

1.7 MORTAR MATERIALS
A. Portland Cement: ASTM C150, Type I or III, nonstaining, without air entrainment and of natural color or white, to produce the required color of mortar or grout.

B. Hydrated Lime: ASTM C207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C150, Type I or III, and hydrated lime complying with ASTM C207.

D. Masonry Cement: ASTM C91. (optional)

E. Mortar Cement: ASTM C1329. (optional)

F. Aggregates: ASTM C144, except for joints less than 1/4 inch, use aggregate graded with 100 percent passing the No. 16 sieve.

G. Water: Potable.

H. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes.

I. Epoxy Pointing Mortar:

J. Integral Water Repellent Admixture (Exterior): An integral liquid polymeric admixture intended for use with concrete masonry units, containing integral water repellent.

1.8 MORTAR MIXES
A. Do not use calcium chloride in mortar or grout.

TABLE A1 - Guide for the Selection of Masonry Mortars* (Modified)

Location	Building Segment	Mortar Type
Exterior, above grade	loadbearing wall nonloadbearing wall, parapet wall, chimney and veneer wall	S N
Exterior, at or below grade	foundation wall, retaining wall, manholes, sewers, pavements, walks and patios	S
Interior	loadbearing wall nonloadbearing partitions	N N

* This table does not provide for many specialized mortar uses, such as reinforced masonry, acid-resistant mortars and fire box mortar.

1.9 GROUT MATERIALS

A. Portland Cement: ASTM C150, Type I.

B. Fine Aggregates: ASTM C404, clean, sharp, natural sand.

C. Coarse Aggregates: ASTM C404. Maximum aggregate size 3/4 inch.

D. Water: Potable.

E. Flyash: May be substituted for up to 20 percent of the total cementitious materials in the grout mix.

1.10 GROUT MIXES

A. Grout mixes shall be plant mix or factory blended (dry mix with water added at the site).

B. Do not lower the freezing point of grout by use of admixtures or anti-freeze agents.
1. Do not use calcium chloride in grout.

C. Grout for Unit Masonry: Comply with ASTM C476.
1. Fine Grout: 2500 psi average compressive strength at 28 days for 6 inches and smaller hollow concrete masonry units and between 2 wythes of masonry where space is less than 2 inches in width.

2. Coarse Grout: 2500 psi average compressive strength at 28 days for 8 inches and larger hollow concrete masonry units and between 2 wythes of masonry where space is 2 inches in width or wider.

1.11 CONTINUOUS WIRE REINFORCING AND TIES FOR MASONRY
A. Masonry Joint Reinforcement.

B. For single wythe and composite masonry, provide ladder type joint reinforcing.

C. For multi-wythe masonry, provide as follows:
1. When both wythes are to be constructed simultaneously:
a. Provide ladder type joint reinforcing.

2. When each wythe is to be constructed separately:
a. Provide adjustable ladder type joint reinforcing fabricated with two steel side rods, cross rods, eyes and double legged pintles. Longitudinal rods shall be spaced for each face shell of CMU; eye sections shall extend into walls cavity, and pintles shall rest upon bed joints of face brick.

1.12 ANCHORING DEVICES FOR MASONRY
A. Rigid Anchors: Where masonry is to be rigidly anchored to structural steel beams, provide galvanized steel straps, bars or rods welded to the steel beam and extending into the mortar joint.

B. Flexible Anchors: Where masonry is to be laterally supported from structural steel, while permitting only vertical movement or both vertical and horizontal movement, provide adjustable anchors.

1.13 REINFORCING BARS

A. Uncoated Steel Reinforcing Bars

1.14 FLASHING

A. Embedded Flashing Materials
1. Provide one of the following types of flashing materials:
a. Copper-Fabric Laminate.
b. Rubber Asphalt Sheet Flashing.
c. Elastomeric Thermoplastic Flashing.
d. EPDM Flashing.

2. Sheet Metal Drip Edge: Fabricated from stainless steel or copper with hemmed edge.
a. Application: Where drip edge is required per recommendations of NCMA-TEK 19-4.
b. Embedded flashing materials should not be used for drip edges.

1.15 INSULATION

A. Insulation: Provide insulation as required to meet or exceed thermal performance required or modeled by ASHRAE Standard 90.1.
1. Primary insulation shall be one of the following:
a. Extruded-Polystyrene Board Insulation: ASTM C578, Type IV.
b. ***Closed-cell*** polyurethane foam ***insulation***.

2. Secondary, if required for thermal resistance:
a. Loose-Granular Fill Insulation.
b. Molded-Polystyrene Insulation Units.
c. Polyurethane Spray Foam (Foamed-in-Place Insulation).

1.16 RELATED MATERIALS

A. Additional accessories, including compressible fillers, preformed control-joint gaskets, bond breaker strips, weep/vent products, cavity drainage material, reinforcing bar positioners and cleaners may be used at the discretion of the Project Designer to provide a complete weathertight masonry assembly.

1.17 CONTROL JOINTS – EMPIRICAL METHOD
A. Concrete Masonry Units

TABLE 1
CONTROL JOINT SPACING FOR RECOMMENDED ABOVE GRADE EXPOSED CONCRETE MASONRY WALLS (NCMA TEK-10-2B)

Distance between joints should not exceed the lesser of:	
Length to height ratio	or ft (m)
1-1/2	25 (7.62)

Notes:

1. Table values are based on the use of horizontal reinforcement having an equivalent area of not less than 0.025 in.^{2}/ft. (52.9 mm^2/m) of height to keep unplanned cracks closed.
2. Criteria apply to all concrete masonry units.
3. This criteria is based on experience over a wide geographical area. Control joint spacing should be adjusted up or down where local experience justifies but no farther than 25 ft. (7.62 m).
   a. Where concrete masonry is used as backup of other materials:
      1) Extend control joints through facing if it is rigidly bonded (masonry bond).
      2) Control joint need not extend through facing when bond is flexible (metal ties).
   b. Provide a horizontal slip plane where reinforced lintel beam terminates at a control joint. Provide horizontal slip plane at junction of roof and load-bearing masonry terminating at a control joint.

B. Expansion Joints in Brick: Provide in accordance with BIA Technical Note No. 18B.

1.18 FLASHING AND WEEP HOLES

A. General: Installed 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. Install concealed through-wall flashing in accordance with SMACNA "Architectural Sheet Metal Manual" Chapter 4 Flashing and with NCMA TEK Bulletins 19-4 and 19-5 details to ensure water resistant masonry construction.

2. Installed preformed corners and end dams, under flexible flashing membrane, bedded in sealant (as approved by manufacturer of preformed corner, end dams, and flexible flashing for compatibility) in appropriate locations along wall.

1.19 SOURCE QUALITY CONTROL

A. Masonry Contractor shall water test cavity to verify all water is draining to the exterior through the weeps before continuing with exterior wythe before capping wall.

1. Contractor shall perform tests in the presence of CM, A/E, testing lab representative, and General Contractor.

a. Do not proceed more than 3 veneer courses above flashing without testing, observation, and picture documentation by testing lab representative.

2. Contractor shall hold water hose and with standard water pressure force water into the cavity at a cell vent so water can be observed coming out adjacent weeps for a period of at least 5 minutes. Contractor shall continue down the wall to the next cell vent where a weep did not indicate water wicking out and continue this process until the entire length of flashing is tested.

3. Where water is observed inside the building or outside the building away from the weeps, masonry units shall be removed and flashing re-inspected and repaired.

4. Water test shall be re-performed where flashing was repaired.

LEED SUGGESTIONS

2.1 Masonry normally generates large volumes of construction waste. However, masonry is clean waste and is, therefore, easily recycled as fill material.

LESSONS LEARNED

3.1 Flashing: Through-wall flashing and weep holes are detailed and installed in exterior masonry wall construction to collect and divert moisture to the outside of the wall that penetrates the exterior veneer. Through-wall flashing must be provided at the base of the wall, at roof and wall intersections, and at the top of parapets. Flashing is also needed over and under door and window openings, at shelf angles, and at other horizontal discontinuities in the cavity.

A. One non-ideal design issue that has surfaced is when the top of the roofing counter-flashing is not in the same joint as the bottom of the through-wall flashing. This causes some masonry to be unprotected. Since all masonry is permeable to water, water permeating this unprotected masonry can possibly enter the building. Ideally, the design would provide the through-wall flashing drip edge and the top of the roof counter-flashing in the same joint, thereby leaving no masonry wall area unprotected.

B. Flashing details that should be included to avoid construction deficiencies include:

1. Roof-wall flashing integration along sloped roofs.
2. Stepped counter-flashing along sloped roof-wall intersections.
3. Stepped roof-wall flashing and counter-flashing where the elevation of a flat roof changes.
4. Flashing integration where parapets intersect with walls.
5. End dams.

END OF SECTION

Table 1 – Calculated STC Ratings for Concrete Masonry Walls (ref. 1)

Nominal Unit thickness, In.(mm)[b]	Density, pcf (kg/m^3)	STC[a] Hollow unit	Grout-filled unit	Sand-filled unit	Solid unit
4 (100)	85 (1,362)	43	46[c]	45	45
	95 (1,522)	44	46[c]	45	45
	105 (1,682)	44	46[c]	46	46
	115 (1,842)	44	47[c]	46	46
	125 (2,002)	45	47[c]	46	47
	135 (2,162)	45	47[c]	47	47
6 (150)	85 (1,362)	44	49	47	47
	95 (1,522)	44	50	48	48
	105 (1,682)	45	50	48	49
	115 (1,842)	45	51	49	50
	125 (2,002)	46	51	49	51
	135 (2,162)	46	52	50	51
8 (200)	85 (1,362)	45	53	50	50
	95 (1,522)	46	53	51	51
	105 (1,682)	46	54	51	52
	115 (1,842)	47	55	52	53
	125 (2,002)	47	55	52	54
	135 (2,162)	48	56	53	55
10 (250)	85 (1,362)	46	56	53	53
	95 (1,522)	47	57	53	54
	105 (1,682)	48	58	54	55
	115 (1,842)	48	58	55	57
	125 (2,002)	49	59	56	58
	135 (2,162)	50	60	56	59
12 (300)	85 (1,362)	47	60	55	55
	95 (1,522)	48	61	56	57
	105 (1,682)	49	62	57	59
	115 (1,842)	49	62	58	60
	125 (2,002)	50	63	59	62
	135 (2,162)	51	64	59	63

[a] Based on: grout density of 140 lb/ft^3 (2,243 kg/m^3); sand density of 90 lb/ft^3(1,442 kg/m^3): unit percentage solid from mold manufacturer's literature for typical units (4-in.(100-mm) 73.8% solid, 6-in.(150-mm) 55.0% solid, 8-in.(200-mm) 53.0% solid, 10-in.(250-mm) 51.7% solid, 12-in. (300-mm) 48.7% solid). STC values for grout-filled and sand-filled units assume the fill materials completely occupy all voids in and around the units. STC values for solid units are based on all mortar joints solidly filled with mortar.

[b] Metric dimensions reflect equivalent metric unit sizes as opposed to direct SI conversions. Therefore, STC ratings of these hard metric units may be slightly different from the ratings listed here.

[c] Because of small core size and the resulting difficulty consolidating grout, these units are rarely grouted.

SECTION 042250

AUTOCLAVED AERATED CONCRETE (AAC) MASONRY

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for Autoclaved Aerated Concrete (ACC) Masonry Block

1.2 AUTOCLAVED AERATED CONCRETE (ACC) BLOCKS

A. AAC Masonry Block: ASTM C1386 for tolerances, density, and compressive strength.

1.3 ACCESSORIES

A. Mortar Materials: ASTM C 270.

B. Reinforcement: Continuous wire reinforcing, horizontal wall reinforcing.

C. Veneer Ties
1. Anchors
2. Fasteners

D. Concealed Flashing Materials
1. Copper-Fabric Laminate
2. Rubber Asphalt Sheet Flashing
3. EPDM Flashing

LESSONS LEARNED

2.1 Autoclaved aerated concrete (AAC) is a type of lightweight precast concrete, prevalent in Europe, Asia, and in the Middle East and recently available through manufacturing facilities in the United States. It is made with portland cement, silica sand or fly ash, lime, water, and aluminum powder or paste. The aluminum reacts with the products of hydration to release millions of tiny hydrogen gas bubbles that expand the mix to approximately five times the normal volume. When set, the AAC is cut into blocks or slabs and steam-cured in an autoclave.

2.2 AAC is significantly lighter (about 1/5th the weight of traditional concrete) than normal concrete and can be formed into blocks or panels. Lighter weight concretes generally have greater fire and thermal resistance, but less strength than traditional normal weight concrete.

END OF SECTION

SECTION 042700

GLASS MASONRY UNITS

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for glass block set in mortar.

1.2 GLASS BLOCK

A. Hollow Glass Block: Hollow units made from transparent glass, with manufacturer's standard edge coating.

B. Solid Glass Block: Colorless, transparent, solid glass block with smooth or stippled faces and manufacturer's standard edge coating.

1.3 MORTAR MATERIALS

A. Portland Cement.

B. Hydrated Lime.

C. Portland Cement-Lime Mix.

D. Aggregrate.

E. Water-Repellent Admixture: Provide at all exterior joints.

1.4 ACCESSORIES

A. Panel Reinforcement: Ladder-type units, butt welded, not lapped and welded.
   1. Interior Walls: Hot-dip galvanized, carbon-steel wire.
   2. Exterior Walls: Hot-dip galvanized, carbon or stainless-steel wire.

B. Panel Anchors: Hot-dip galvanized after fabrication.

END OF SECTION

SECTION 047200

CAST STONE

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for cast Stone Trim

1.2 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer is a producing member of the Cast Stone Institute, or has on file and follows a written quality-control plan that includes all elements of the Cast Stone Institute's "Quality Control Procedures Required for Plant Inspection."

1.3 CAST STONE MATERIALS

A. General: Comply with ASTM C1364
1. Portland Cement.
2. Aggregates.

B. Reinforcement: Use galvanized or epoxy-coated reinforcement when covered with less than 1½ inches of cast stone material.

C. Embedded Anchors: Hot-dip galvanized steel.

D. Mortar: Portland cement and lime, masonry cement, or mortar cement.

1.4 FABRICATION

A. Provide units that are resistant to freezing and thawing.

LESSONS LEARNED

2.1 The term 'cast stone' is defined by the Cast Stone Institute and in ASTM C 1364, Specification for Architectural Cast Stone, as architectural precast concrete building units intended to simulate natural cut stone. Cast stone is typically distinguished from other architectural precast concrete by its size (masonry- or stone-sized units rather than panels) and its finish, which is intended to simulate stone rather than look like concrete. Cast stone is usually made with more carefully graded aggregate and less water than most architectural precast concrete, giving it a higher compressive strength, lower water absorption, and a more void-free surface than most architectural precast concrete.

2.2 Cast stone is used, like limestone or sandstone, as a masonry material for architectural features and trim or as a facing for buildings or other structures. By carefully selecting aggregates, cement, and pigments and through controlled manufacturing techniques, cast stone can be made to resemble various varieties of limestone, sandstone, quartzite, granite, and other unpolished, cut building stones. This ability to simulate natural cut stone can be used to replace damaged natural stone in historic renovation work where the original stone is no longer available.

2.3 Cast stone units must be designed within the manufacturing and handling limitations of the production process. Keep units generally rectangular in cross section; avoid L or U shaped units. Avoid long thin units; length should not exceed 15 times the least dimension and should generally be no more than 96 inches. Thickness should never be less than 2 inches, and 3 inches, as a minimum, is even better. Curved sections should be limited to no more than 48 inches in length. Generally, size units so that their volume is about 1 ½ to 2 cu.ft. Bear in mind the casting process when designing with cast stone; the profiles of units must include adequate "draft", which is the slope on surfaces that allows the cast stone unit to be removed from the mold. Also remember that repetition is the key to economy in any molded product; unless standard cast stone units are used, try to use as few types as feasible with as much repetition as possible.

END OF SECTION

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05 METALS

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SECTION 051200

STRUCTURAL STEEL FRAMING

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for structural steel, shop painting, grout, and related items necessary to complete the Work indicated.

1.2 QUALITY ASSURANCE

A. Quality Standards: AISC 303 and 360.

B. All load-bearing structural steel shall be fabricated and produced using only steel made in the United States in accordance with Sections 153.011 and 153.99 of the Ohio Revised Code (ORC).

1.3 MATERIALS

A. Structural Steel Shapes: W-shapes, channels, angles, M-shapes, S-shapes, plate and bar, cold-formed hollow structural sections, and steel pipe.
   1. W-Shapes: ASTM A992.
   2. Channels, Angles, M- and S-Shapes: ASTM A36 or ASTM A572, Grade 50.
   3. Plate and Bar: ASTM A36 or ASTM A572, Grade 50.

B. Steel Casings

C. Steel Forgings

D. Bolts, Nuts, and Washers: High strength and tension control, high strength

E. Anchor Rods: Unheaded and headed rods, nuts, plate washers, and washers.

F. Connectors: Shear connectors, threaded rods, clevises, turnbuckles, eye bolts and nuts and sleeve nuts.

G. Structural Slide Bearings

H. Primer: Zinc oxide, oil.
   1. Coordinate primers with topcoats, requirements for slip critical joints, and limitations of sprayed fire resistive materials.

I. Grout: Metallic, shrinkage resistant and nonmetallic, shrinkage resistant.

J. Bituminous Coating: Cold applied asphalt mastic.

1.4 SHOP PRIMING

A. Shop prime steel surfaces except the following:
   1. Surface embedded in concrete or mortar.
      a. Apply a bituminous coating to steel embedded in concrete or mortar.

2. Surfaces to be field welded.
3. Surfaces to be high strength bolted with slip critical connections.
4. Surfaces to receive sprayed fire resistive materials (applied fireproofing).
5. Galvanized surfaces.

1.5 GALVANIZING

A. Galvanize lintels, shelf angles, and welded door frames attached to structural steel frame and located in exterior walls.

1.6 INSTALLATION

A. Erect structural steel in compliance with the AISC "Specifications and Code of Standard Practice."
   1. OSHA safety practices for steel erection per Federal Register 29 CFR 1926, Subpart R.

LEED SUGGESTIONS

2.1 LEED credits may be obtained under Materials and Resources for using materials with recycled content. The requirements are based on a cost-based formula for the total recycled content of all materials used on the project, excluding mechanical, electrical, and plumbing components and specialty items such as elevators, so that recycled content in high-cost items is significant. For steel-framed buildings, the recycled content of the steel goes a long way toward meeting the requirements for these credits.

2.2 The Steel Recycling Institute indicated that hollow structural shapes and steel plates are made by basic oxygen furnace method which typically has 23% post consumer recycled content and 1.5% preconsumer recycled content; rolled structural shapes are made by the electric arc furnace method, which typically has 57.5% postconsumer recycled content and 6.5% pre-consumer recycled content. The LEED Credit Interpretations allow the use of 25% for steel without any documentation, but for structural steel it is very worthwhile to obtain the required documentation because structural steel usually consists primarily of rolled structural shapes that have a much higher recycled content.

2.3 U.S.-EPA Comprehensive Procurement Guidelines (CPG) discusses steel manufactured in either a Basic Oxygen Furnace (BOF) or an Electric Arc Furnace (EAF). Steel from the BOF process contains 25-30% total recovered materials, of which 16% is post-consumer steel.

LESSONS LEARNED

3.1 A common coordination problem is the finishing of steel lintels and shelf (relieving) angles. Division 05, Section "Metal Fabrications" requires galvanizing of exterior loose-steel lintels or shelf angles; Division 05, Section "Structural Steel Framing" may require shop priming of structural steel members. If lintels or shelf angles are attached to the structural-steel frame, the steel fabricator may shop primer them unless the Contract states otherwise. If the Designer intends these lintels or shelf angles to be galvanized, retain this requirement in Division 5, Section "Structural Steel Framing".

END OF SECTION

SECTION 052100

STEEL JOISTS FRAMING

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for steel joists, accessories, and related items necessary to complete to the Work indicated.

1.2 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing joists similar to those indicated for this Project and with a record of successful in–service performance.

1. Manufacturer must be certified by SJI to manufacturer joists to those indicated for this Project and with a record of successful in –service performance.
2. Assumes responsibility for engineering special joists to comply with performance requirements. This responsibility includes preparation of shop drawings and comprehensive engineering analysis by a qualified professional engineer.
3. Professional Engineer Qualifications: A professional engineer who is legally authorized to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installation of joists that are similar to those indicated for this Project in material, storage, and extent.

1.3 MATERIALS

A. Steel: Comply with SJI and AISC "Standard Specifications."

1. Yield strength used as a basis for the design stresses shall be as follows:
   a. Chords = 50,000 psi
   b. Webs = 36,000 psi or 50,000 psi

B. Bolts: Carbon or high-strength carbon steel.

1. Finish: Plain, uncoated.

C. Primer: SSPC – Paint 15.

1. Coordinate primer with topcoats and sprayed fire-resistive materials and primers.

LEED SUGGESTIONS

2.1 Refer to Division 5, Section "Structural Steel Framing".

LESSONS LEARNED

3.1 Low-sloped roofing requires a roofing slope of at least ¼ inch per 12 inches. Besides using tapered insulation ($$$), measures to eliminate or reduce unwanted ponding of water on the roof include sloping joists to a low point or specifying joists with pitched top chords. Pitch may be one way where slope is in one direction or two ways where slope is in both directions.

A. Except for K-series joists that have top chords fabricated parallel or without pitch as standard, steel joists and joist girders may be fabricated with a top-chord pitch of 1/8 inch per 12 inches. This standard top-chord pitch will not be sufficient alone to meet the minimum ¼ inch per 12 inches (1:48) slop requirement.

3.2 Where shop priming is not permitted (were sprayed fire-resistive material is to be applied), distinguish locations of primed and unprimed joists on the drawings.

END OF SECTION

SECTION 053100

STEEL DECKING

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for metal floor and roof deck of fluted, ribbed, and cellular configurations; composite decks of metal and acoustical insulation; anchors, closures, and related accessories.

1.2 MATERIALS

A. Type: Steel for galvanized metal deck, ASTM A 653, structural quality Grade 33 or higher, G60 zinc coating, unless otherwise noted.
   1. Noncomposite steel form deck, when design of concrete slab meets all loading requirements without assistance from steel deck, engineer may reduce galvanized coating to G30.
   2. Note: Prime-painted decking is not acceptable.

B. Accessories: Flexible closure strips, pour stops, girder fillers, column closures, end closures, Z-closers, cover plates, and sump plate.

1.3 FABRICATION

A. Decking, General: Fabricate panels to comply with SDI Specifications and Commentary in SDI Publication No. 30.

B. Acoustical Roof Deck Units: ***NRC as determined by Designer.***

LEED SUGGESTIONS

2.1 Refer to Division 05, Section "Structural Steel Framing".

END OF SECTION

SECTION 054000

COLD-FORMED METAL FRAMING

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for bracing, fasteners, and related accessories for light gauge, loadbearing metal elements.

1.2 SYSTEM DESCRIPTION

A. Design Requirements: Calculate structural characteristics of cold-formed metal framing according to AISI's "Specification for The Design of Cold-Formed Steel Structural Members" ***and its "Standard for Cold-Formed Steel Framing – General Provisions".***
   1. Design exterior nonaxial load bearing framing to accommodate lateral deflection without regard to contribution of sheathing materials.
   2. Headers: Design according to AISI's "Standard for Cold-Formed Steel Framing – Header Design."
   3. Roof Trusses: Design according to AISI's "Standard for Cold-Formed Steel Framing – Truss Design."
      a. Note: Prefabricated trusses that meet the qualitative requirements are acceptable.

B. Performance Requirements: Engineer, fabricate, and erect cold-formed metal framing to withstand design loads within limits and under conditions required.
   1. Design framing systems to withstand design loads without deflections greater than the following:
      a. Cold-Formed Metal Framing: Lateral deflection of 1/240 of the wall height, unless otherwise noted.
         1) Limit deflection to 1/600 when supporting masonry.
      b. Floor Joists: Vertical deflection of 1/480 for live loads and 1/360 for total loads of span.
      c. Ceiling Joists: Vertical deflection of 1/240 of the span.
      d. Roof Trusses: Vertical deflection of 1/240 of the span.

1.3 COLD-FORMED METAL FRAMING MATERIALS

A. Galvanized Steel Sheet: ASTM A 1003, Structural Grade, Type H, metallic coated of grade and coating, and as follows:
   1. Coating Designation: G 60 (Z 275), unless otherwise noted.
      a. Provide G90 where studs backup masonry, and where indicated.
   2. Grade: As required for structural performance.

B. System Components: With each type of metal framing required, provide manufacturer's standard steel runners (tracks), blocking, lintels, clip angles, shoes, reinforcements, fasteners, and accessories as recommended by manufacturer for applications indicated, as needed to provide complete metal framing system.
   1. Steel Sheet for Vertical Deflection and Drift Clips: ASTM A 653, structural steel, zinc coated, of grade and coating as follows:

a. Grade: As required by structural performance.
b. Coating: G60.

C. Framing Accessories: Supplementary framing, bracing, bridging, and solid blocking, web stiffeners, gusset plates, stud kickers, girts, joist hangers, and end closures.

D. Insulation for Inaccessible Voids.

END OF SECTION

SECTION 055000

METAL FABRICATIONS

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for metal items fabricated from standard metal shapes and plates that are not classified in other locations.

1.2 PRODUCTS

A. Materials: Steel plates, shapes, and bars. Steel tubing, steel pipe, slotted channel framing, iron castings, and aluminum.

B. Miscellaneous Framing and Supports: Galvanized where indicated.
1. Steel framing and supports for ceiling-hung toilet compartments, operable partitions, overhead doors, overhead grilles, countertops, and mechanical and electrical equipment.
2. Elevator machine beams, hoist beams.
3. Steel shapes for supporting elevator door sills.

C. Shelf Angles: Galvanized at exterior walls.

D. Metal Ladders - Including Elevator Pit Ladders: Steel, unless otherwise noted.
1. Exterior ladders: Galvanized or aluminum.

E. Ladder Safety Cages: ***Match ladder.***

F. Alternating Tread Devices: Steel.

G. Metals Ships' Ladders: Steel.

H. Metal Floor Plate: Steel.

I. Structural-Steel Door Frames:
1. Exterior frames galvanized.

J. Miscellaneous Steel Trim: Steel angle corner guards, steel edgings, and loading-dock edge angles.
1. Exterior trim galvanized.

K. Metal Bollards: Schedule 40 steel pipe.

L. Pipe and Downspout Guards.
1. Galvanized.

M. Abrasive Metal, Nosings, Treads, and Thresholds: Cast iron, cast aluminum, or extruded aluminum.

N. Metal Downspout Boots: Cast iron or aluminum.

O. Loose Bearing and Leveling Plates, Galvanized.

P. Loose Steel Lintels, Galvanized at Exterior Walls.

Q. Steel Weld Plates and Angles not specified in other sections, for casting into concrete.

LEED SUGGESTIONS

2.1 Refer to Division 05, Section “Structural Steel Framing”.

END OF SECTION

SECTION 055100

METAL STAIRS

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for metal stairs.
   1. Railings attached to metal stairs or attached to walls adjacent to metal stairs may be added to this section.

1.2 MATERIALS

A. Abrasive Nosings: Extruded aluminum.

B. Stringers: Steel channels or tubes.
   1. Plate strings are not acceptable.

C. Metal-Pan Stairs: Uncoated cold-rolled or uncoated hot-rolled.

D. Metal Bar-Grating Stairs: ½ inch maximum opening.
   1. For service and exterior applications.

E. Metal Floor Plate Stairs: Rolled steel.
   1. For service applications.

1.3 FINISHES

A. Hot-dip galvanize items exposed to exterior or greater than 75% relative humidity.

END OF SECTION

SECTION 055213

PIPE AND TUBE RAILINGS

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for pipe railings and guards.

1.2 METALS

A. Steel and Iron
1. Steel Pipe
a. Black finish, unless otherwise indicated.
b. Galvanized finish for exterior installations and where indicated.
2. Steel Tubing: Cold-formed steel tubing.
3. Steel Plates, Shapes, and Bars.
4. Iron Castings.
5. Expanded Metal.
6. Perforated Metal.
7. Woven-Wire Mesh.

B. Aluminum
1. Extruded Bars and Tubing.
2. Extruded Structural Pipe and Round Tubing.
3. Plate and Sheet.
4. Castings.
5. Perforated Metal.
6. Woven-Wire Mesh.

1.3 FABRICATION

A. Changes in Direction of Members: By bending or by inserting prefabricated fittings.

B. Connections: Either welded or non-welded.

C. Infill: Provide either vertical picket, expanded metal, perforated metal, or woven-wire mesh.

D. Toe Boards.

LEED SUGGESTIONS

2.1 Refer to Division 5, Section "Structural Steel Framing".

LESSONS LEARNED

3.1 Guard rail infill must be designed so a 4-inch sphere cannot pass through it, as to comply with code requirements. Horizontal rails as infill can be readily climbed by children and should be avoided. Economical options for infill include vertical pickets, expanded metal, perforated metal, or woven-wire mesh.

END OF SECTION

06 DIVISION

WOODS, PLASTICS, AND COMPOSITES

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061600 ***Sheathing***
062000 ***Finish Carpentry***
064023 ***Interior Architectural Woodwork***

SECTION 061000

ROUGH CARPENTRY

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for miscellaneous wood framing, incidental rough carpentry required for support or attachment of other construction, pressure preservative treated and fire retardant treated wood.

1.2 PRODUCTS

A. Lumber
1. Maximum moisture content: 19 percent.
2. Factory mark each piece of lumber with grade stamp.

B. Boards
1. Maximum moisture content: 19 percent.

C. Fasteners: Hot-dip galvanized or stainless steel where exposed to weather, in ground contact, in contact with treated wood, or in area of high relative humidity.

1.3 WOOD PRESERVATIVE TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.
1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.

1.4 FIRE RETARDANT TREATED MATERIALS

A. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
1. Use treatment that does not promote corrosion of metal fasteners.
2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when testing according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.

LESSONS LEARNED

3.1 Increased corrosion of steel fasteners is a concern with preservative treatments, especially those containing ammonia and higher concentrations of copper (which will generally replace those containing arsenic). For this reason, hot-dip galvanized steel or stainless steel fasteners should be used with pressure-preservative-treated lumber.

3.2 WOOD PRESERVATIVE TREATMENT

A. Where carpentry may be subject to deterioration by moisture or insect attack, consider using pressure-preservative-treated material. Provide provisions for preservative-treated wood in locations required by building codes and in certain locations where wood should always be treated, such as wood used with roofing and flashing, on the damp side of vapor barriers and waterproofing, and items such as sills, sleepers, furring, blocking, and stripping if in contact with masonry or concrete located below grade. Provisions for treating wood in other locations should be added as required on a project-by-project basis. If the additional locations for the use of treated wood are too complex to describe in the specifications, identify them by notes on the Drawings.

B. Arsenic has been used in most of the treatment chemicals used for treating wood used in building construction since the 1970's, when the use of pentachlorophenol was largely eliminated. Some of the treatment chemicals that contain arsenic also contain chromium. The wood treatment industry has voluntarily phased out the use of the most common arsenic-based treatment (chromated copper arsenate, also called CCA) for treated wood intended for residential and similar uses, although the EPA has not declared pressure-treated wood that contains arsenic to be hazardous. The phase out required that wood treated after 2003 not contain CCA. Because the phase-out applied to residential use, CCA has generally been eliminated from use with all dimension lumber, its used being largely restricted to utility poles and piling. The phase-out does not apply to ACZA (ammoniacal copper zinc arsenate), which also contains arsenic, and which is often used to treat Douglas fir and other species that are difficult to treat, due to their high density and resultant poor absorption of treatment chemicals.

C. Boron is effective for controlling fungi, molds, and insects such as termites that use these wood-destroying organisms to break down and digest wood fibers. Boron is also relatively safe for human beings and animals and is inexpensive. The one problem with boron is that its compounds are very water soluble. It is easy and inexpensive to treat wood with boron, but the wood must be protected from getting wet. For most of the building framing, which will be enclosed in the finished building, boron treatment is ideal, for protection against termites, but care must be exercised to ensure that the treatment is not washed out by rain before the framing can be covered. If boron treatment is used, provisions should be included for spray treatment by an exterminator of wood that has become wet.

END OF SECTION

SECTION 061600

SHEATHING

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for wall sheathing, roof sheathing, including vented nailboard, building wrap, sheathing joint and penetration treatment and flexible flashing at openings in sheathing.

1.2 WOOD PANEL PRODUCTS, GENERAL

A. Plywood: Either DOC PS 1 or DOC PS 2, unless otherwise indicated.

1.3 PRESERVATIVE-TREATED PLYWOOD

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

1.4 FIRE-RETARDANT-TREATED PLYWOOD

A. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.

2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when testing according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.

1.5 WALL SHEATHING

A. Plywood Wall Sheathing.

B. Glass-Mat Gypsum Wall Sheathing.

C. Cellulose Fiber-Reinforced Gypsum Sheathing.

D. Extruded-Polystyrene-Foam Wall Sheathing.

1.6 ROOF SHEATHING

A. Plywood Roof Sheathing: Exterior, Structural I sheathing.

1. Provide 5/8 inch nominal thickness for 24 inch rafter spacing.

B. Oriented-Strand-Board Roof Sheathing: Exposure 1, Structural 1 sheathing.

1. Provide 5/8 inch nominal thickness for 24 inch rafter spacing.

C. Composite Nail Base Insulated Roof Sheathing

1. Type: Vented.
2. Board Insulation: Either polyisocyanurate or extruded polystyrene.
3. Oriented Strand Board: Board shall not exceed its APA span rating based on the spacing of the spacer blocks.
   a. The spacer blocks within the ventilation space shall not exceed 10 percent of the panel area and will allow air to flow both up the slope and horizontally. The air space shall provide a minimum of 9 sq. in. net free area per lineal foot of installation.

1.7 FASTENERS

A. Fasteners: Hot-dip galvanized or stainless steel where exposed to weather, in ground contact, in contact with treated wood, or in area of high relative humidity.

1.8 WEATHER-RESISTANT SHEATHING PAPER

A. Building Wrap: ASTM E 1677, Type I air retarder; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized.

B. Building-Wrap Tape: Pressure-sensitive plastic tape recommended for sealing joints and penetrations in building wrap.

1.9 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sealant for Glass-Mat Gypsum Sheathing Board: Silicone emulsion sealant, compatible with sheathing tape and sheathing, and recommended for use with glass-fiber sheathing tape and for covering exposed fasteners.

B. Sheathing Tape for Glass-Mat Gypsum Sheathing Board: Self-adhering glass-fiber tape, for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing board.

C. Sheathing Tape for Foam-Plastic Sheathing: Pressure-sensitive plastic tape for sealing joints and penetrations in sheathing.

1.10 MISCELLANEOUS MATERIALS

A. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.025 inch.

LEED SUGGESTIONS

2.1 Emissions: Products shall meet the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

END OF SECTION

SECTION 062000

FINISH CARPENTRY

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for wood construction that can be purchased ready made and installed by a finish carpenter, not requiring the specialized skills of architectural woodwork fabrication.

1.2 QUALITY ASSURANCE

A. Quality Standards: Architectural Woodwork Institute (AWI) "Quality Standards."
1. Custom grade.

1.3 INTERIOR MATERIALS

A. General: Provide materials that comply with requirements of the AWI Woodworking Standard for each type of woodwork and quality grade indicated and, where the following products are part of woodwork, with requirements of the referenced product standards, that apply to product characteristics indicated:
1. Hardboard: AHA A135.4
2. High Pressure Laminate: NEMA LD3.
3. Medium Density Fiberboard: ANSI A208.2, made with binder containing no urea-formaldehyde resin.
4. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea-formaldehyde resin.
5. Straw-based particleboard: ANSI A208.1, Grade M-2, except for density.
6. Softwood Plywood: PS 1.
7. Hardwood Plywood and Face Veneers: HPVA HP-1, made with binder containing no urea-formaldehyde resin.

1.4 EXTERIOR MATERIALS

A. Exterior Standing and Running Trim and Rails
1. Dimensional lumber of rot resistance species.
a. Redwood, South American ipe, bald cypress, cedar, black locust, and black walnut.

1.5 STANDING AND RUNNING, TRIM AND RAILS FOR TRANSPARENT FINISH

A. Standing and running trim shall be custom grade hardwood, conforming to AWI Section 300.

1.6 FACTORY FINISHING OF INTERIOR WOODWORK

A. Quality standard complies with AWI Section 1500.

B. General: The prefinishing of interior architectural woodwork is required to be preformed at factory as specified in this section.

C. Transparent Finish: Comply with requirements indicated below for grade, finish system, staining, effect, and sheen.
   5. Grade: Custom
   6. AWI Finish System TR-6 - Catalyzed Polyurethane
   7. Staining: As determined by Designer.
   8. Effect: Open grain
   9. Sheen: As determined by Designer.

END OF SECTION

SECTION 064023
INTERIOR ARCHITECTURAL WOODWORK

GENERAL GUIDELINES

1.1 SECTION INCLUDES
- A. Qualitative requirements for shop-fabricated wood and laminate-clad fabrications.
  - 1. Section includes custom-fabricated cabinets and countertops.

1.2 QUALITY ASSURANCE
- A. Quality Standards: Architectural Woodwork Institute (AWI) "Quality Standards."
  - 1. Custom grade.

1.3 MATERIALS
- A. Wood Products
  - 1. Hardboard: AHA A135.4
  - 2. Medium Density Fiberboard: ANSI A208.2, made with binder containing no urea-formaldehyde resin.
  - 3. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.
  - 4. Straw-based Particleboard: ANSI A208.1, Grade M-2, except for density.
- B. Thermoset Decorative Panels
- C. High-Pressure Decorative Laminate: NEMA LD3, grades as required by woodwork quality standard.

1.4 HARDWARE
- A. Butt Hinges.
- B. Wire Pulls: Back-mounted, metal.
- C. Catches, Adjustable Shelf Standards and Supports, and Shelf Rests.
- D. Drawer Slides: Builders Hardware Manufacturers Association (BHMA): Minimum standards of BHMA A156.9.
  - 1. Heavy Duty (Grade 1 HD-100).
  - 2. Box Drawer Slides: Grade 1 HD-100.
  - 3. File Drawer Slides: Grade 1 HD-200.
  - 4. Pencil Drawer Slides: Grade 1.
  - 5. Keyboard Slides: Grade 1 HD-100.
- E. Locks: Door and drawer.
- F. Grommets, Casters, Leveling Guides, and Articulating Keyboard Assemblies.

1.5 FABRICATION
- A. Comply with requirements of AWI for Custom Grade, unless otherwise noted.

LEED SUGGESTIONS

2.1 Emissions: Products shall meet the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Enviornmental Chambers."

END OF SECTION

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07 DIVISION

THERMAL AND MOISTURE PROTECTION

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075000	***Membrane Roofing***
075113	***Built-Up Asphalt Roofing***
075200	***Modified Bituminous Membrane Roofing***
075323	***EPDM Roofing***
075400	***Thermoplastic Membrane Roofing***
075700	***Coated Foamed Roofing***
076200	***Sheet Metal Flashing and Trim***
077100	***Roof Specialties***
077200	***Roof Accessories***
078100	***Applied Fireproofing***
078400	***Firestopping***
079200	***Joint Sealants***

SECTION 071000

DAMPPROOFING AND WATERPROOFING

LESSONS LEARNED

3.1 While dampproofing and waterproofing qualitative requirements are not included in the Design Manual, they can be none the less important to a successful project.

3.2 Bituminous dampproofing is primarily used on concrete and masonry walls to reduce vapor migration into interior spaces. Waterproofing will resist liquid and vapor water under hydrostatic pressure, but dampproofing will only impede liquid water and vapor-absent hydrostatic pressure. Although most below-grade walls are not typically exposed to continuous hydrostatic pressure, even intermittent exposure may be enough to ruin interior finishes and preclude the use of dampproofing. Dampproofing is required on walls that retain earth and enclose interior spaces where ground water is within 6 inches of the lowest floor.

3.3 The Design Team should review the Geotechnical report for recommendations on dampproofing and waterproofing.

END OF SECTION

SECTION 072100

THERMAL INSULATION

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for organic and inorganic insulation applied for thermal protection in walls, ceilings, attics, and crawl spaces; under concrete slabs on grade; and at perimeter of foundations.

1.2 PERFORMANCE REQUIREMENTS

A. Plenum Rating: Glass and slag-wool-fiber / rock-wool-fiber insulation rated for resistance against erosion and mold growth per UL 181.

1.3 MATERIALS

A. Extruded Polystyrene Board Insulation
   1. ***Type VI, 40 p.s.i.*** minimum density.

B. Unfaced Mineral Fiber Blanket Insulation
   1. Mineral Fiber Type: Fibers manufactured from glass, slag wool, or rock wool.

C. Faced Mineral Fiber Blanket Insulation
   1. Mineral Fiber Type: Fibers manufactured from glass, slag wool, or rock wool.

D. Foil-Faced, Glass-Fiber Board Insulation: Nominal density of 6 lb/cu.ft.

E. Glass-Mat-Faced, Glass-Fiber Board Insulation: Nominal density of 6 lb/cu.ft.

F. Unfaced, Slag-Wool-Fiber / Rock-Wool- Fiber Board Insulation: Nominal density of 6 lb/cu.ft.

G. Cellulosic-Fiber Loose Fill: Chemically treated for flame resistance.

H. Glass-Fiber Loose Fill.

I. Foamed-in-Place Insulation
   1. Silicate foam.
   2. Open-cell polyurethane: Water-based polyurethane, low-density, no VOC emissions after 30 days; foaming agent: carbon dioxide and water.

J. Closed-cell polyurethane Foam Insulation: ASTM C 1029, Type II, 1.5 lb.cu.ft.
   1. Foam insulation required between all windows and doors at head, jamb, and sill.

K. Auxiliary Insulating Materials
   1. Vapor-retarder tape
   2. Adhesive for bonding insulation
   3. Insulation fasteners

L. Self-Supported, Spray-Applied Cellulosic Insulation.

M. Vapor Retarders.

LEED SUGGESTIONS

2.1 Qualifying for a credit under the LEED Rating System requires a reduction in design energy cost compared to the energy cost budget for regulated energy components described in the requirements in ASHRAE 90.1. Insulation plays a major role in determining the extent of design energy-cost reductions. To obtain the maximum number of points under the "Energy and Atmosphere – Optimize Energy Performance", an 'integrated design' approach with the Mechanical Engineer is important.

2.2 Product Data for Credit EQ 4: Indicate products meet the testing and product requirements of the California Department of Health Services Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers, including 2004 Addenda.

2.3 Sustainability Requirements: Provide glass-fiber insulation as follows:

A. Low Emitting: Insulation tested according to ASTM D 5116 and shown to emit less than 27-ppb formaldehyde.

2.4 Sustainability Requirements: Provide spray-applied cellulosic insulation as follows:

A. Low Emitting: Insulation tested according to ASTM D 5116 and shown to emit less than 27-ppb formaldehyde.

LESSONS LEARNED

3.1 Thermal Resistance and Thermal Resistivity

A. Thermal resistance (R-value) is a measure of resistance to heat flow of the "total thickness" of an insulating material or construction. Thermal resistivity (r-value) is a measure of resistance to heat flow of a "unit thickness" of a homogeneous insulating material. The performance of non-homogenous materials such as fibrous blanket insulation is always reported using total thermal resistance, not unit thermal resistivity. For insulation in board form, which is homogeneous, the performance is reported in unit thermal resistivity. Where thermal resistivity if used, the total thermal resistance can be calculated by multiplying the unit thermal resistivity by the actual thickness in inches, or in SI (metric) units, by fractions of a meter.

B. For thermal blanket insulation, the location and thermal resistance are properly shown on the Drawings rather than indicated in the Specifications. For thermal insulation in board form, the location and thickness are shown on the Drawings and the thermal resistivity is indicated in the Specifications.

C. Because the performance of acoustical blanket insulation is not related to heat flow, neither thermal resistance nor thermal resistivity is used, even though thermal and acoustical blanket insulation may be identical. The location and thickness of acoustical blanket is shown on the Drawings.

3.2 Placement and Anchorage

A. Difficult spaces to insulate include floor-to-window wall junctures and partition-to-exterior wall junctures. Gaps in insulation at such locations can be successfully insulated by using spray polyurethane foam insulation.

END OF SECTION

SECTION 072700

AIR BARRIERS

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for air barrier system ***located in the building envelope (extending from the base of the wall to the high point of the roof).***

B. Materials and installation to bridge and seal the following air leakage pathways and gaps:

1. Gaps between walls and roof and roof plane intersections.
2. Control joints in concrete masonry units (CMU).
3. Openings and penetrations of window frames, storefront, and curtain wall.
4. Barrier envelope systems; i.e. metal panels, precast concrete, etc.
5. Piping, conduit, duct, and similar penetrations in the exterior envelope.
6. Miscellaneous air leakage pathways in the building envelope.
7. Building assemblies used as plenums.

1.2 PERFORMANCE REQUIREMENTS ***AND CHARACTERISTICS***

A. ***The continuous air barrier is <u>required</u> and shall have the following characteristics:***

1. It shall be continuous throughout the envelope (at the lowest floor, exterior walls, and ceiling or roof), with all joints and seams sealed and with sealed connections between all transitions in planes and changes in materials and at all penetrations.
2. The air barrier component of each assembly shall be joined and sealed in a flexible manner to the air barrier component of adjacent assemblies, allowing for the relative movement of these assemblies and components.
3. It shall be capable of withstanding positive and negative combined design wind, fan, and stack pressures on the air barrier without damage or displacement, and shall transfer the load to the structure. It shall not displace adjacent materials under full load.
4. It shall be installed in accordance with the manufacturer's instructions and in such a manner as to achieve the performance requirements.
5. Where lighting fixtures with ventilation holes or other similar objects are to be installed in such a way as to penetrate the continuous air barrier, provisions shall be made to maintain the integrity of the continuous air barrier.

B. The continuous air barrier shall comply these performance requirements:

1. Use individual materials that have an air permeance not exceeding 0.004 cfm/ft^2 under a pressure differential of 0.3" w.g. (1.57psf) (0.02 L/S.m^2 @ 75 Pa) when tested in accordance with ASTM E 2178; OR
2. Use assemblies of materials and components that have an average air leakage not to exceed 0.04 cfm/ft^2 under a pressure differential of 0.3" w.g. (1.57psf) (0.2 L/s.m^2 @ 75 Pa) when tested in accordance with ASTM E 1677; OR
3. Test the completed building and demonstrate that the air leakage rate of the building envelope does not exceed 0.40 cfm/ft^2 under a pressure differential of 0.3" w.g. (1.57psf) (0.2 L/s.m^2 @ 75 Pa) in accordance with ASTM E 779 or an equivalent approved method.

1.3 MATERIALS ***AND ASSEMBLIES***

A. ***The following materials comply with the performance requirements:***
1. ***Plywood – minimum 3/8" (10mm)***
2. ***Oriented strand board – minimum 3/8" (10mm)***
3. ***Extruded polystyrene insulation board – minimum 3/4" (19 mm)***
4. ***Foil-back urethane insulation board – minimum 3/4" (19 mm)***
5. ***Exterior or interior gypsum board – minimum 1/2" (12 mm)***
6. ***Cement board – minimum 1/2" (12 mm)***
7. ***Built-up roofing membranes***
8. ***Modified bituminous roof membrane***
9. ***Fully-adhered single-ply roof membrane***
10. ***A Portland cement/sand parge or gypsum plaster minimum 5/8" (16 mm) thick.***
11. ***Cast-in-place and precast concrete***
12. ***Full-grouted concrete block masonry***
13. ***Sheet steel***
14. ***Closed-cell sprayed-in-place polyurethane foam***
15. ***Self-stick sheet rubberized-asphalt barrier***

B. The following assemblies comply with the performance requirements:
1. ***Assemblies that include a continuous air barrier material and comply with ASTM E 2357 or ASTM E 1677 and section 1.2 B above.***
2. ***Concrete masonry walls with:***
   a. ***One application of block filler and two applications of a paint or sealer coating, OR***
   b. ***A Portland cement/sand parge stucco or plaster minimum 1/2" (12 mm) thick, OR***
   c. ***Fluid-applied elastomeric bitumen or synthetic rubber applied per manufacturer's recommendation for minimum thickness to comply with performance requirement (1.2 B above).***

1.4 Pre-Installation conferences shall be used to establish standards of workmanship for installation and for coordination among contractors.

LESSONS LEARNED

2.1 Air barrier and vapor barrier are two distinct functions. Two functions may be provided by one material which has both characteristics or the functions may be satisfied by two separate materials occurring in different planes of the building envelope.

2.2 A vapor barrier/retarder should occur on the interior side of the thermal insulation.

2.3 An air barrier/ retarder can be provided and satisfactorily serve its purpose in a variety of locations in the plane of the wall and roof.

2.4 Air movement can carry exponentially more moisture into and through the building envelope than vapor diffusion alone, which can lead to mold and fungi growth, the corrosion and premature deterioration of building components, and the staining of interior and exterior facades.

2.5 The Department of Energy has concluded that up to 40% of the energy consumed to heat and cool a building can be attributed to air leakage into and out of buildings. The effort to conserve energy and minimize losses from the interior environments of buildings has resulted in the need for tighter building envelopes. To control air leakage through building envelopes, air barriers as an air-impermeable component within the wall or roof have been incorporated into some building codes.

2.6 Air barriers are a component of the building envelope that control the movement of air into (infiltration) and out of (exfiltration) building walls and roofs due to differences in wind pressure, stack pressure, and HVAC fan pressure.

A. Wind: Produces positive air pressure on the windward façade of a building and negative air pressures on the leeward and side facades and on the roof. The magnitude of negative wind forces has been widely documented for roofing applications where substantial uplift loads must be resisted by roof assembly.

B. Stack Effect: The effect of air rising or falling within a building due to temperature differences between air in the building and air outside the building. Stack effect in heating seasons in cold climates can cause air infiltration at the lower levels of a building and air exfiltration in the upper levels. The reverse occurs in warm climates with air conditioning cooling the inside air causing it to fall. Air infiltrates the upper levels of a building and exfiltrates in the lower levels. Stack effect forces can be significant and sustained for several months. The air barrier must be capable of resisting these forces.

C. Fan Pressure: HVAC system pressurization that maintains a building interior with a positive pressure. Air under pressure attempts to infiltrate through the building envelope. Positive HVAC pressurization is usually intended to reduce infiltration and pollutants and to counter stack effect air pressure.

2.7 The resultant air pressures about the entire building envelope will influence the HVAC design pressures as well as indicate the magnitude of forces that the air barrier will be required to sustain.

2.8 Air exfiltration from a heated or air-conditioned interior space through the building envelope increases energy consumption as the building's HVAC system produces more conditioned air than would be required in a building with a properly functioning air barrier.

2.9 Air infiltration into a heated or air-conditioned building also increases energy consumption as the building's HVAC system corrects the interior temperature and humidity to the desired levels.

A. Air barriers restrict the movement of moisture into building cavities. Moisture-laden air condensing in walls and the roof can lead to mold growth, metal framing corrosion, building materials deterioration, and wet insulation losing its insulating characteristics.

B. Air barriers serve a different role in a building envelope than vapor retarders, which control the diffusion of moisture vapor into and out of building envelopes. Many air barrier materials also function as vapor retarders; others are vapor permeable. The location within the wall of combined air barriers/vapor retarders and of separate vapor retarders and air barriers is governed by the difference between interior and exterior environmental conditions.

END OF SECTION

SECTION 073113
ASPHALT SHINGLES

GENERAL GUIDELINES

1.1 SECTION INCLUDES
- A. Qualitative requirements for roof shingles, underlayment, and fastening products and methods.

1.2 QUALITY ASSURANCE
- A. All products used must be approved by shingle manufacturer prior to use.
- B. Exterior Fire-Text Exposure: Class A; ASTM E108 or UL 790, for application and roof slopes indicated.

1.3 WARRANTY
- A. Special Warranty
  1. Material Warranty Period: 40 years from date of contract completion, prorated, with first 5 years nonprorated.
  2. Wind-Speed Warranty Period: Resist blow-off or damage caused by wind speeds up to 80 m.p.h. for a minimum 5 years from date of contract completion.

1.4 SHINGLES
- A. Laminated-Strip Asphalt Shingles: ASTM D3462, laminated, multi-ply overlay construction, glass-fiber reinforced, mineral-granule surfaced, and self-sealing.

1.5 ROOFING ACCESSORIES
- A. Felt Underlayment.
- B. Self-Adhering Sheet Underlayment.
- C. Ridge Vent: Rigid, high-density plastic or flexible, mat filter.

1.6 METAL TRIM AND FLASHING
- A. Perimeter Edge Metal: Provide one of the following metal types and thickness:
  1. 26 gauge (0.019 inch thick), prefinished galvanized steel
  2. 0.032 inch thick, prefinished aluminum
- B. Penetration Flashings: Provide one of the following metal types and thickness:
  1. 26 gauge (0.019 inch thick), prefinished galvanized steel or stainless steel.
  2. 0.032 inch thick, prefinished aluminum.
  3. 16 ounce (0.022 inch thick), copper.
- C. Valley Construction (Open Valleys): Provide one of the following metal types and thickness:
  1. 26 gauge (0.019 inch thick), prefinished galvanized steel or stainless steel.
  2. 0.032 inch thick, prefinished aluminum.
  3. 16 ounce (0.022 inch thick), copper.
- D. Apron, Step, Cricket, or Backer Flashings: Provide one of the following:
  1. 26 gauge (0.019 inch thick), prefinished galvanized steel or stainless steel.
  2. 0.032 inch thick, prefinished aluminum.
  3. 16 ounce (0.022 inch thick), copper

1.7 INSTALLATION
- A. General: Comply with manufacturer's instructions and recommendations but not less than those recommended by ARMA's "Residential Asphalt Roofing Manual" or "The NRCA Steep Roofing Manual."
  1. Fasten asphalt shingles to roof sheathing with nails.

END OF SECTION

SECTION 074113

METAL ROOF PANELS

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for vertical-rib, seamed-joint, standing-seam metal roof panels.

1.2 WARRANTY

A. Special Warranty on Panel Finishes: 20 years.

B. Special Weathertightness Warranty for Standing-Seam Metal Roof Panels: 20 years.

1.3 PRODUCTS

A. Standing-Seam Metal Roof Panels:
1. Profile: Vertical rib, seamed joint.
2. Material: Aluminum-zinc alloy-coated steel.
3. Exterior Finish: 2-coat fluoropolymer, ***70 percent PDVF resin.***

B. Accessories:
1. Vapor retarder, if required by Design Team.
2. Thermal insulation: Faced polyisocyanurate board or extruded-polystyrene board.
3. Self-adhering, high-temperature sheet underlayment ***(optional over entire roof).***
4. Slip sheet.
5. Substrate boards.
6. Miscellaneous metal framing.
7. Flashing and trim.
8. Gutters.
9. Downspouts.
10. Roof curbs.
11. Snow guards: Seam-mounted, stop or bar types. Surface mounted is not acceptable.
12. Pipe flashing.
13. Soffit panels.

LEED SUGGESTIONS

2.1 Buildings seeking LEED accreditation can receive a point for Sustainable Sites – Heat Island Effect for steep-sloped roofs having a Solar Reflectance Index (SRI) of 29 or more.

END OF SECTION

SECTION 074213

METAL WALL PANELS

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for factory-formed and field-assembled, exposed or concealed fastener, lap-seam metal wall panels.

1.2 MATERIALS

A. Thermal Insulation for Field-Assembled Metal Wall Panels: Extruded polystyrene board.

B. Substrate Board.

C. Miscellaneous Metal Framing.

D. Panel Material
1. Metallic-Coated Steel Sheet Prepainted with Coil Coating.
a. Zinc-Coated (galvanized) Steel Sheet.
b. Aluminum-Zinc Alloy-Coated Steel Sheet.

1.3 PRODUCTS

A. Exposed/Concealed-Fastener, Lap-Seam Metal Wall Panels
1. Profile: As selected by A/E.
2. Material: Zinc-coated (galvanized) steel or aluminum-zinc alloy-coated steel sheet. No aluminum.
3. Exterior Finish: ***2-coat*** Fluoropolymer.

B. Accessories
1. Flashing and trim.
2. Metal soffit panels.

END OF SECTION

SECTION 074216

INSULATED-CORE METAL WALL PANELS

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for foamed-insulation-core metal wall panels and laminated-insulation-core metal wall panels.

1.2 PANEL MATERIALS

A. Metallic-Coated Steel Sheet
1. Zinc-Coated (Galvanized) Steel Sheet.
2. Aluminum-Zinc Alloy-Coated Steel Sheet.

B. Aluminum Sheet.

1.3 PANEL CORES

A. Polyisocyanurate Insulation: Closed cell, modified polyisocyanurate foam using a non-CFC blowing agent, foamed-in-place or board type, with flame-spread index of 75 or less and smoke-developed index of 450.

1.4 FOAMED-INSULATION-CORE METAL WALL PANELS

A. Concealed-Fastener, Foamed-Insulation-Core Metal Wall Panels: Formed with tongue-and-groove panel edges; designed for sequential installation by interlocking panel edges and mechanically attaching panels to supports using concealed clips or fasteners.

1.5 LAMINATED-INSULATION-CORE METAL WALL PANELS

A. Shiplap-Edge, Laminated-Insulation-Core Metal Wall Panels: Formed with flush exterior panel facing and with shiplap edges; designed for sequential installation by mechanically attached panels to supports using concealed clips and fasteners; with factory-applied sealant or gaskets in side laps.

1.6 ACCESSORIES

A. Miscellaneous Metal Framing.

B. Flashing and Trim.

END OF SECTION

SECTION 074219

METAL PLATE WALL PANELS

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for factory-formed and field-assembled metal plate wall panels.

1.2 PERFORMANCE REQUIREMENTS

A. Air Infiltration: ASTM E 283.

B. Water Penetration under Static Pressure: ASTM E 331.

C. Structural Performance: ASTM E 330.
1. Deflection Limits: 1/180.

1.3 WARRANTY

A. Materials and Workmanship: Two years.

B. Finishes: 20 years.

1.4 MATERIALS

A. Miscellaneous Metal Framing: Subgirts, base or sill angles or channels, hat-shaped rigid furring channels, and cold-rolled furring channels.

1.5 PRODUCTS

A. Metal Plate Wall Panels
1. Material: Aluminum or steel sheet.
2. Thickness: 0.120 inch minimum.
3. Exterior Finish: 2-coat fluoropolymer (70% PVDF resin), clear anodized or color anodized.

1.6 INSTALLATION

A. Installation Method: Flange attachment, clip, subgirt and spline, track support, rail support, or rainscreen principle.

END OF SECTION

SECTION 074243

COMPOSITE WALL PANELS

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for factory-formed, metal-faced composite wall panels with thin thermoplastic cores.

1.2 PERFORMANCE REQUIREMENTS

A. Air Infiltration: ASTM E 283.

B. Water Penetration under Static Pressure: ASTM E 331.

C. Structural Performance: ASTM E 330.

1.3 WARRANTY

A. Materials and Workmanship: Two years.

B. Finishes: 20 years.

1.3 MATERIALS

A. Miscellaneous Metal Framing: Subgirts, base or sill angles or channels, hat-shaped rigid furring channels, and cold-rolled furring channels.

1.4 PRODUCTS

A. Metal-Faced Composite Wall Panels:
1. Material: Aluminum faced.
2. Thickness: 0.157 inch (4mm) minimum.
3. Exterior Finish: 2-coat fluoropolymer (70% PVDF resin), 3-coat fluoropolymer, 4-coat fluoropolymer, mica fluoropolymer, metallic fluoropolymer, FEVE fluoropolymer, clear anodized, color anodized, mill, acrylic finish for maintaining an “aged” finish, acrylic finish for maintaining a “penny-bright” finish, or pre-patinated.

1.5 INSTALLATION

A. Installation Method: Clip, track support, subgirt and spline, or rainscreen principle.

END OF SECTION

SECTION 075000

MEMBRANE ROOFING

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. General qualitative requirements for roofing system applied to the structural substrate, over insulation, or protected with insulation (protected membrane) as appropriate to the particular assembly.

1. Built-up bituminous roofing
2. Elastomeric membrane roofing
3. Thermoplastic membrane roofing
4. Modified bituminous membrane roofing

1.2 SYSTEM DESCRIPTION

A. General: Provide installed roofing membrane and base flashings that remain watertight, do not permit the passage of water, and resist uplift pressure calculated according to ASCE 7, thermally induced movement, and exposure to weather without failure.

B. Design Requirements

1. All roofs shall be designed and built to ensure positive drainage.
   a. Positive Drainage: The drainage condition in which consideration has been made during design for all loading deflections of the deck, and additional roof slope has been provided to ensure drainage of the roof area within 48 hours of rainfall, during ambient drying conditions.

1.3 QUALITY ASSURANCE

A. Exterior Fire Test Exposure: Class A, comply with ASTM E108.

1.4 SEQUENCING

A. Work shall begin only after opening and penetrations are in place and adjacent work required for complete tie-in are in place. This includes flashing in masonry walls with special attention given to roof to wall transitions.

1. Work shall not begin before the "Preinstallation Conference" and conditions exist necessary for a successful completion of roofing have occurred.

2. Work shall not begin without the presence of manufacturer's representative, A/E and Testing Laboratory, if required.

B. Arrange work sequence to avoid use of newly constructed roofing as a walking surface or for equipment movement and storage. Where such access is absolutely required, the Applicator shall provide all necessary protection and barriers to segregate the work area and to prevent damage to adjacent areas.

C. After work on roof is started, no traffic will be permitted on the roof other than necessary for the roofing application and inspection. Materials shall not be piled on the roof to the extent that design live loads are exceeded. Roofing materials shall not be transported over unfinished or finished roofing or existing roofs unless adequate protection is provided.

1.5 WARRANTY

A. Roofing Warranty: Minimum manufacturer's ***20 year total system warranty***.

1.6 BUILT-UP ASPHALT ROOFING
A. Refer to Section 075113.

1.7 MODIFIED BITUMINOUS MEMBRANE ROOFING
A. Refer to Section 075200.

1.8 EPDM ROOFING
A. Refer to Section 075323.

1.9 THERMOPLASTIC MEMBRANE ROOFING
A. Refer to Section 075400.

2.0 INSTALLATION
A. Install roofing membrane systems according to roofing system manufacturer's written instructions and applicable recommendations of NRCA's "Quality Control Guidelines".

LEED SUGGESTIONS

2.1 Buildings seeking LEED accreditation can receive a point for Sustainable Sites – Heat Island Effect for low-sloped roofs having a Solar Reflectance Index (SRI) of 78 or greater.

2.2 Qualifying for a credit under the LEED Rating System requires a reduction in design energy cost compared to the energy cost budget for regulated energy components described in the requirements in ASHRAE 90.1. Insulation plays a major role in determining the extent of design energy-cost reductions. To obtain the maximum number of points under the Energy and Atmosphere – Optimize Energy Performance, an "integrated design" approach with the Mechanical Engineer is important.

LESSONS LEARNED

3.1 Roof System: The term "roof system" is defined by these documents as "a system of interacting roof components, generally consisting of a membrane or primary roof covering, roof insulation and flashings designed to waterproof and improve the building's thermal resistance."

3.2 Warranties: Two types of comprehensive materials-and-workmanship warranties are commonly offered. Known as no-dollar-limit warranties and total-system warranties, these warranties usually bind the roofing installer to the manufacturer to make repairs during the first two years of the warranty period; thereafter, the system manufacturer agrees to provide labor and materials to repair leaks.
A. Total-system warranties are required by the Ohio School Design Manual to offer the Owner a single entity to resolve roofing leaks that are traceable to the roofing membrane and other roofing components. Therefore the specification prepared by the Design Team should provide provisions for a total-system approach.

3.3 Insulation: Roof insulation is prone to temperature-induced movement, which can create problems over time. Joints between insulation boards need to be loosely butted to avoid gaps. ***Install insulation in two layers*** with joints offset in each direction, which reduces thermal bridging and makes the roofing system more energy efficient.

3.4 Additional items to be considered for a successful roof (one without leaks) includes:
A. Possible inspections by a Registered Roof Observer or Registered Roof Consultant from the Roofing Consultants Institute.
B. Thermographic scans by Owner for finished systems at job completion. This maybe included as part of the Enhanced Building Commissioning work.
C. Hold trades other than the roofing contractor accountable for work on finished roof.

END OF SECTION

SECTION 075113

BUILT-UP ASPHALT ROOFING

GENERAL GUIDELINES

1.1 SECTION INCLUDES
- A. Qualitative requirements for roofing systems composed of alternating layers of bituminous sheets and viscous bituminous coatings over an insulated deck.

1.2 SYSTEM DESCRIPTION
- A. Provide one of the following built-up roofing membrane systems for insulated substrates:
  - 1. BU-I-A-G (4)-A (Built-Up Roof Membrane Over Insulated Deck Using Asphalt with Glass Fiber Ply Sheets and Aggregate Surfacing)
  - 2. BU-I-L-***G2(coated base)*** (4)-A (Built-Up Roof Membrane Over Insulated Deck Using, Cold Liquid-Applied Asphalt with Ply Sheets and Aggregate Surfacing)

1.3 MATERIALS
- A. Base Sheet: As recommended by manufacturer.
- B. Ply Felt: Asphalt impregnated, glass fiber felt, complying with ASTM D 2178, ***Type VI or 28 lb. coated based sheets as required by manufacturer to meet warranty requirements.***

1.4 FLASHING MATERIALS
- A. Flashing Sheet
  - 1. Provide one of the following:
    - a. SBS modified asphalt sheet, mineral granule surfaced, ***ASTM 6162 (composite sheet) or ASTM 6164 (polyester).***
    - b. APP modified asphalt sheet, mineral granule surfaced, ***ASTM 6223 (composite).***

1.5 ASPHALT MATERIALS
- A. Roofing Asphalt: As recommended by built-up roofing membrane manufacturer.
- B. Cold Applied Adhesive.

1.6 AUXILIARY MEMBRANE MATERIALS
- A. Aggregate Surfacing.
- B. Substrate Board: If required by the Design Team or roof system manufacturer by project conditions.
- C. Vapor Retarder: If required by the Design Team by project conditions.
- D. Roof Coating: If required by the Design Team by project conditions.
- E. Walkways: Provide ***at roof access points and recommended*** by system manufacturer.

1.7 POLYISOCYANURATE BOARD INSULATION
- A. Insulation shall have a minimum compressive strength of 20 psi and be faced on both top and bottom.
- B. Provide tapered insulation, preformed saddles, crickets, tapered edge strips, and other insulation shapes as required for “positive drainage”.

1.8 INSULATION ACCESSORIES

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatible with membrane roofing.

B. Fasteners.

C. Cold Fluid-Applied Adhesive.

D. Wood Nailer Strips.

E. Cover Board

1. Perlite insulation board.
2. ***Cellulosic-fiber insulation board.***

1.9 GENERAL INSTALLATION REQUIREMENTS

A. Install built-up roofing membrane system according to roofing system manufacturer's written instructions and applicable recommendations of ARMA/NRCA's "Quality Control Guidelines for the Application of Built-Up Roofing".

1. Install roofing system according to applicable specification plates of NRCA's "The NRCA Roofing and Waterproofing Manual".

LEED SUGGESTIONS

2.1 Credit EQ 4.1 relates to indoor air quality within the building and sets limits for the VOC content of adhesives and sealants that may emit this VOCs into the interior space of the building. Because many adhesives and sealants used in roofing are used beneath the roof membrane, the volatile materials in them cannot be vented to the exterior and end up in the occupied space. For this reason, the requirements of this credit apply to roofing sealants and adhesives unless they are used exclusively on the exterior side of the roof membrane.

LESSONS LEARNED

3.1 If permanent roofing membrane is installed before roof-top work by other contractors is completed, a common scenario, the roofing membrane can be damaged. Although obvious damage can be remedied, long-term problems may still develop that may not be covered by a warranty. Confining rooftop construction operations to specific areas and enforcing protection requirements will also offer a measure of protection to the permanent roofing membrane.

3.2 The cost of temporary roofing, installed for the Contractor's convenience or to minimize the risk of incurring a penalty for delaying the overall Project completion, is the Contractor's responsibility.

3.3 Temporary roofing SHALL NOT be permitted to be retained as part of a final roofing membrane. It is easily damaged during the construction period. Moisture may enter the temporary roofing membrane and the dangers associated with phased construction of a BUR system may also be introduced. Ply slippage may occur between the temporary roof surface and the succeeding plies of the BUR roofing system. Interrupted or phased construction of the BUR roofing system is not recommended by roofing system manufacturers or NRCA.

END OF SECTION

SECTION 075200

MODIFIED BITUMINOUS MEMBRANE ROOFING

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for roofing systems formed with modified bituminous membranes over an insulated deck.
   1. Provide one of the following systems:
      a. MBA (1)-I-(T, M or L)-G(2)-M or A (Modified Bitumen APP Roofing Membrane Over Insulated Deck, Mopped or Set In Cold, Liquid-Applied Adhesive, with Glass Fiber Ply Sheet and Mineral or Aggregate Surfacing)
      b. MBS (1)-I-(T, M or L)-G(2)-M or A (Modified Bitumen SBS Roof Membrane Over Insulated Deck, Mopped or Set In Cold, Liquid-Applied Adhesive, with Glass Fiber Ply Sheet and Mineral or Aggregate Surfacing)

1.2 MATERIALS

A. Cap Sheet: Provide one of the following:
   1. SBS-Modified Bituminous Cap Sheet: SBS-modified asphalt sheet, smooth surfaced, dusted with fine parting agent on both sides or granular surfaced; suitable for application method specified; manufacturer's standard thickness and weight; for use and of reinforcing type as follows:
      a. Use: Roof membrane and base flashing.
      b. Reinforcing: Composite woven ***(ASTM 6162)*** and glass fiber mat.
   2. APP-Modified Bituminous Cap Sheet, Smooth Surfaced: Atactic polypropylene modified asphalt sheet, smooth surfaced; suitable for application method specified; manufacturer's standard thickness and weight; for use and of reinforcing type as follows:
      a. Use: Roof membrane and base flashing.
      b. Reinforcing: Composite woven ***(ASTM 6162)*** and glass fiber mat.

1.3 AUXILIARY MEMBRANE MATERIALS

A. Protective Surfacing
   1. Aggregate Surfacing.

   2. Roof Granules.

B. Roofing Asphalt: As recommended by modified bituminous membrane manufacturer.

C. Cold-Applied Adhesive.

D. Substrate Board: If required by Design Team or roof system manufacturer by project conditions.

E. Vapor Retarder: If required by Design Team or roof system manufacturer by project conditions.

F. Walkways: Provide ***at roof access points and recommended*** by system manufacturer.

1.4 BASE SHEET MATERIALS

A. Base Sheet: Unperforated, asphalt impregnated and coated, glass fiber sheet, dusted with fine mineral surfacing on both sides.

1.5 BASE-PLY FELTS

A. Base-Ply Felt: Asphalt ***coated***, glass fiber felt, ***complying with ASTM D 2178, Type VI or 28 lb. coated base sheets as required by manufacturer to meet warranty requirements.***

1.6 POLYISOCYANURATE BOARD INSULATION

A. Insulation shall have a minimum compressive strength of 20 psi and be faced on both top and bottom.

B. Provide tapered insulation, preformed saddles, crickets, tapered edge strips, and other insulation shapes as required for “positive drainage”.

1.7 INSULATION ACCESSORIES

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatible with membrane roofing.

B. Fasteners.

C. Cold Fluid-Applied Adhesive.

D. Wood Nailer Strips.

E. Cover Board
1. Perlite insulation board.
2. ***Cellulosic-fiber insulation board.***

1.8 INSTALLATION

A. Install modified bituminous membrane roofing system according to roofing system manufacturer’s written instructions and applicable recommendations of NRCA/ARMA’s “Quality Control Recommendations for Polymer Modified Bitumen Roofing”.
1. Install roofing system according to applicable specification plates of NRCA’s “The NRCA Roofing and Waterproofing Manual”.

END OF SECTION

SECTION 075323

EPDM ROOFING

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for roofing systems formed with nonvulcanized and vulcanized elastomeric membranes over an insulated deck.
   1. ***Fully-Adhered*** Thermoset Membrane Roofing.

1.2 EPDM SHEET

A. Uniform, flexible sheet formed from a terpolymer of ethylene-propylene-diene (EPDM), complying with ASTM D 4637, of the following grade, class, thickness, backing, and exposed face color:
   1. Thickness: ***60 mils, nominal.***
      a. ***Type II***, scrim or fabric internal reinforced.
      b. Backing: Unbacked.
      c. Black
   2. Thickness: 60 mils, nominal.
      a. Type I, non-reinforced
      b. Backing: Unbacked.
      c. White on black.

B. Sheet Flashing: 60 mil thick EPDM.

1.3 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by roofing system manufacturer for intended use and compatible with EPDM membrane roofing.

B. Protection Sheet: Epichlorohydrin or neoprene non-reinforced flexible sheet.

C. Seaming Material: Manufacturer's standard splice tape.

D. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.

E. Fasteners, lap sealant, bonding adhesive, and water cutoff mastic.

F. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, termination reglets, cover strips, and other accessories.

1.4 SUBSTRATE BOARDS

A. Substrate Board
   1. Glass-mat, water-resistant gypsum substrate.
   2. Gypsum wood fiber composite/fiber-reinforced gypsum.
   3. Perlite board.

1.5 ROOF INSULATION

A. General: Provide one of the following preformed roof insulation boards that comply with roofing system requirements and referenced standards:

1. Extruded-Polystyrene Board Insulation: ASTM C 578, Type IV, 1.6 lb./cu.ft. minimum density, square edged.
2. Polyisocyanurate Board Insulation: 20 psi compressive strength***, minimum,*** and faced on both top and bottom.

B. Provide tapered insulation, preformed saddles, crickets, tapered edge strips, and other insulation shapes as required for "positive drainage".

1.6 INSULATION ACCESSORIES

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatible with membrane roofing.

B. Fasteners.

C. Cold Fluid-Applied Adhesive.

D. Cover Board ***– must be included in the assembly.***

1.7 MEMBRANE INSTALLATION

A. Membrane ***must be*** fully adhered.

LESSONS LEARNED

3.1 Substrate Boards may be used as thermal barriers, as support for vapor barriers, and as part of a fire-resistance-rated roofing system. Substrate boards used as part of a fire-resistance rated roofing system can reduce the amount spray-on fireproofing needed. Value engineering a substrate board out of a rated roof assembly may in turn add cost to the project.

3.2 Cover Boards

A. Elastomeric roofing systems using molded- or extruded-polystyrene insulation or polyisocyanurate insulation may also benefit from cover boards. NRCA has identified conditions where a cover board might be considered for ballasted, fully-adhered, and mechanically-fastened roofing systems.

B. Cover boards are beneficial if the compressive strength of the foam insulation is less than 23 lb/sq.ft. (158 kPa). Foam insulation in roofing systems that will be ballasted or subject to foot traffic may crush, reducing the thermal-insulation value. Extruded-polystyrene insulation in a fully-adhered membrane roofing may be attacked by solvent-based adhesives. Polyisocyanurate felt facers may separate from the foam if subject to long-term roof traffic. Creep under pressure from fastener plates or bars, causing a reduction in clamping pressure, has been reported with molded polystyrene in mechanically-fastened roofing systems. The damage from these situations can be minimized with the use of cover boards.

END OF SECTION

SECTION 075400

THERMOPLASTIC MEMBRANE ROOFING

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for roofing systems formed with reinforced and unreinforced thermoplastic membranes over an insulated deck.
   1. Provide any of the following products:
      a. Thermoplastic Polyolefin Sheet (TPO)
      b. Polyvinyl-Chloride Sheet (PVC)
      c. Ketone Ethylene Ester Sheet (KEE)

1.2 THERMOPLASTIC POLYOLEFIN SHEET (TPO)

A. Reinforced Thermoplastic Polyolefin Sheet: ASTM D 6878, reinforced.
   1. Thickness: 60 mils, ***minimum.***

1.3 Polyvinyl-Chloride SHEET (PVC)

A. PVC Sheet: ASTM D4434, Type III, fabric reinforced.
   1. Thickness: 60 mils, ***minimum.***

1.4 KETONE ETHYLENE ESTER SHEET (KEE)

A. Ketone Ethylene Based Sheet Roofing (KEE): ASTM D6754, reinforced internally with a fabric.
   1. Thickness: ***60 mils, minimum.***

1.5 AUXILIARY MATERIALS

A. General: Finish auxiliary materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing material.

B. Sheet Flashing: As recommended by membrane manufacturer.

C. Slip Sheet.

D. Vapor Retarder: If required for assembly as determined by Design Team.

E. Fasteners.

F. Walkways.

G. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, termination reglets, cover strips, and other accessories.

1.6 SUBSTRATE BOARDS

A. Substrate Board, provide one of the following:
1. Glass-mat, water-resistant gypsum substrate.
2. Gypsum wood fiber composite/fiber-reinforced gypsum.
3. Perlite board.

1.7 ROOF INSULATION

A. General: Provide one of the following preformed roof insulation boards that comply with roofing system requirements and referenced standards.
1. Extruded-Polystyrene Board Insulation: ASTM C 578, Type IV, 1.6 lb./cu.ft. minimum density, square edged.
2. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Grade 2, felt or glass-fiber met facer on both major surfaces.

B. Provide tapered insulation, preformed saddles, crickets, tapered edge strips, and other insulation shapes as required for “positive drainage”.

1.8 INSULATION ACCESSORIES

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatible with membrane roofing.

B. Fasteners.

C. Cold Fluid-Applied Adhesive.

D. Cover Board ***– must be included in the assembly.***

1.9 INSTALLATION

A. Membrane shall be adhered.

END OF SECTION

SECTION 075700

COATED FOAMED ROOFING

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for low-slope roofing assemblies consisting of spray-applied materials which expand through chemical reaction and an elastomeric coating.

1.2 PERFORMANCE REQUIREMENTS

A. Uplift pressure calculated according to SEI / ASCE 7.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: SPFA accreditation for company.

B. Fire-Test-Response Characteristics
   1. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indexes of 75 and 450, respectively.
   2. Exterior Fire-Test Exposure: Class A.

1.4 WARRANTY

A. Coated Formed Roofing Manufacturer's Warranty: ***20 years***.

1.5 MATERIALS

A. Polyurethane Foam: ASTM C 1029, Type III; with in-place density of 2.8 to 3.0 lb/cu.ft. and flame-spread index of 75 or less.

B. Silicone Coatings: One- or two-component silicone.

C. Thermal Barrier: If required for roof assembly as determined by Design Team.

D. Vapor Retarder: As recommended by coated foamed roofing manufacturer and Design Team.

E. Mineral Granules: Ceramic-coated roofing granules.

F. Walkway Pads: Formed of nonwoven PVC strands.

1.6 INSTALLATION

A. Install thermal barrier to resist uplift pressures according to roofing system manufacturer's written instructions.

B. Apply base coat and topcoat at thickness recommended by coated foamed roofing manufacturer.

C. Apply mineral granules over coated polyurethane foam.

END OF SECTION

SECTION 076200

SHEET METAL FLASHING AND TRIM

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for shop- and field-formed accessories trim.

1.2 QUALITY ASSURANCE

A. Quality Standard: SMACNA's "Architectural Sheet Metal Manual".

1.3 WARRANTY

A. Fluoropolymer Finishes: 10 years.

1.4 MATERIALS

A. Sheet Metals, ***Exposed***
1. Copper sheet
2. Aluminum sheet with smooth, flat or embossed surface.
a. Class I clear anodic finish.
b. Class I color anodic finish.
c. Coil-Coated Finish: two-coat fluoropolymer.
3. Stainless-Steel Sheet: Polished directional satin finish with smooth, flat surface.
4. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel or Aluminum-zinc alloy-coated steel sheet with smooth, flat or embossed surface.
a. Coil-Coated Finish: Two-coat fluoropolymer.

B. Underlayment

1.5 PRODUCTS

A. Formed Flashing and Trim
1. Reglets and Counterflashing: Stainless steel or galvanized steel.
a. Type: Stucco, concrete, or masonry.
1) Surface-mounted type should be avoided.
b. Materials
1) Copper: 16 ounce.
2) Stainless Steel: 0.0187 inch thick.
3) Prepainted, Metallic-Coated Steel: 0.028 inch thick.

B. Formed Roof Drainage Fabrications: Including hanging gutters, downspouts, parapet scuppers, conductor heads, and splash pans.
1. Gutters
a. Girth up to 15 inches
1) Aluminum: 0.032 inch thick.
2) Prepainted, metallic-coated steel: 0.0217 inch thick.
b. Girth 16 to 20 inches
1) Aluminum: 0.040 inch thick.
2) Prepainted, metallic-coated steel: 0.0276 inch thick.

c. Girth 21 to 25 inches
   1) Aluminum: 0.050 inch thick.
   2) Prepainted, metallic-coated steel: 0.0336 inch thick.
d. Girth 26 to 30 inches
   1) Aluminum: 0.063 inch thick.
   2) Prepainted, metallic-coated steel: 0.040 inch thick.
e. Girth 31 to 35 inches
   1) Prepainted, metallic-coated steel: 0.0516 inch thick.

2. Downspouts
   a. Aluminum: 0.024 inch thick.
   b. Prepainted, metallic-coated steel: 0.0217 inch thick.
3. Parapet Scupper
   a. Copper: 15 oz./sq.ft.
   b. Aluminum: 0.032 inch thick.
   c. Prepainted, metallic-coated steel: 0.0276 inch thick.
4. Conductor Heads
   a. Aluminum: 0.032 inch thick.
   b. Prepainted, metallic-coated steel: 0.0276 inch thick.
5. Splash Pans
   a. Aluminum: 0.040 inch thick.
   b. Stainless steel: 0.0187 inch thick.

C. Formed Low-Slope Roof Fabrications: Including roof-penetration flashing and roof-drain flashing.
   1. Roof-Penetration Flashing
      a. Stainless steel: 0.0187 inch thick.
      b. Prepainted, metallic-coated steel: 0.0276 inch thick.
   2. Roof Drain Flashing
      a. Stainless steel: 0.0187 inch thick.
   3. Refer to Section “Roof Specialties” for roof edge flashing and copings.

D. Miscellaneous Formed Fabrications: Including equipment support flashing and overhead-piping safety pans.
   1. Equipment Support Flashing
      a. Stainless steel: 0.0187 inch thick.
      b. Prepainted, metallic-coated steel: 0.0276 inch thick.
   2. Overhead-Piping Safety Pans
      a. Stainless steel: 0.0250 inch thick.
      b. Prepainted, metallic-coated steel: 0.0276 inch thick.

LESSONS LEARNED

3.1 Metal Considerations

A. Compatibility of sheet metal flashing and trim with other materials on the building must be considered. Sustained wash from certain materials onto sheet metal flashing and trim may cause deterioration of metals or finishes. Contact manufacturers to verify whether metals and coatings under consideration are compatible with runoff from adjoining stonework, concrete, or masonry.

B. Metal-to-metal compatibility should also be considered. Avoid contact between metals that are farthest apart in the galvanic scale. See Appendix C in SMACNA's Architectural Sheet Metal Manual for more recommendations for reducing galvanic corrosion.

C. Galvanic corrosion results when two metals are in contact with each other in the presence of an electrolyte such as rainwater or sea water. The less noble, or more anodic, metal will corrode. A galvanic scale, or galvanic series, arranges metals according to their relative electrolytic behavior in a specific electrolyte, which is why the exact order of metals may differ in different galvanic scales. The greater the separation on the scale, the greater the corrosion potential.

3.2 Sheet Metal Thickness and Gages – The sheet metal flashing and trim industry continues to use the term gage to indicate sheet metal thickness for steel and stainless steel, although, according to ASTM standards, sheets metals are only produced in decimal or fractional thicknesses. ASTM A 480/A 480M, Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip, includes the following statement in Section 4, "Ordering Information": "Thickness shall be ordered to decimal or fractional thickness. The use of the gage number is discouraged as being an archaic term of limited usefulness not having a general agreement on meaning." It would be difficult to compare metal thicknesses among manufacturers if the use of gages were retained.

3.3 Wind-Uplift Resistance – Wind-uplift resistance and how sheet metal roof edge flashing and copings are attached at the roof perimeter are issues that have grown in prominence. Perimeter flashing failures are frequently cited as initiating roofing membrane failures during windstorms. FM Global (FMG) reports: "The majority of (low-slope) roof covering failures involve improperly designed or constructed perimeter flashings."

END OF SECTION

SECTION 077100

ROOF SPECIALTIES

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for standard manufactured components, both formed and extruded, serving as roofing perimeter facing, drainage, and expansion control.

1.2 PERFORMANCE REQUIREMENTS

A. Low-slope membrane roof systems metal edge securement, except gutters, shall be designed in accordance with ANSI/SPRI ES-1, except wind speed shall be determined by ASCE 7.

1.3 WARRANTY

A. Painted Finishes: 10 years.

1.4 COPINGS

A. Copings: Manufactured coping system consisting of formed-metal coping cap, concealed anchorage, concealed splice plates with same finish as coping caps, mitered corner units, and end caps.
   1. Coping Caps: Fabricated from one of the following exposed metals.
      a. Aluminum: 0.063 inch thick, minimum
      b. Prepainted, Metallic-Coated Steel Sheet: 0.034 inch thick, minimum.
   2. Corners: Continuously welded or mechanically clinched and sealed watertight.

1.5 ROOF EDGE FLASHINGS

A. Provide one of the following types compatible with roofing system selected, performance and wind-load requirements.
   1. Canted Roof Edge Fascia: Manufactured, two-piece, roof edge fascia consisting of snap-on or compression-clamped metal fascia cover and a continuous formed galvanized steel sheet cant dam, 0.028 inch thick, minimum, with integral drip edge cleat.
      a. Fascia Cover: Fabricated from one of the following metals:
         1) Formed or extruded aluminum or painted, metallic-coated steel sheet in thickness as recommended by NRCA in “Guide for Sheet Metal Fascia Edges”.
   2. Roof Edge Fascia: Manufactured, two-piece, roof edge fascia consisting of snap-on metal fascia cover and a continuous formed- or extruded-aluminum anchor bar with integral drip edge cleat to engage fascia cover.
      a. Fascia Cover: Fabricated from one of the following metals:
         1) Formed or extruded aluminum or painted, metallic-coated steel sheet in thickness as recommended by NRCA in “Guide for Sheet Metal Fascia Edges”.

3. Gravel Stops: Manufactured, one-piece, formed-metal gravel stop with a horizontal flange and vertical leg fascia terminating in a drip edge, continuous hold-down cleat, and concealed splice plates of same material, finish, and shape as gravel stop.
   a. Fabricate from one of the following metals:
      1) Aluminum sheet or painted, metallic-coated steel sheet in thickness as recommended by NRCA in “Guide for Sheet Metal Fascia Edges”.

1.6 GUTTERS AND DOWNSPOUTS

A. Gutters and Downspouts: Manufacture or fabricate gutter complete with end pieces, outlet tubes, and other accessories as required. Furnish flat-stock gutter spacers and gutter brackets from same material as gutters, of size recommended by SMACNA, but not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, and gutter accessories from same metal as gutters.
   1. Fabricate from one of the following metals:
      a. Aluminum sheet or painted, metallic-coated steel sheet in thickness as recommended in the Architectural Sheet Metal Manual, Table 1-5 “Recommended Minimum Gages for Gutter.”

1.7 REGLETS AND COUNTER FLASHINGS

A. General: Provide reglets of type, material, and profile indicated, compatible with flashing. Form to securely interlock with counterflashing.

B. Counterflashing Wind Resistant Clips: Provide clips to be installed before counterflashing to prevent wind uplift of the counterflashing’s lower edge.

C. Material: Fabricate reglets from the following metal in thickness indicated:
   1. Aluminum Sheet: 0.050 inch thick, minimum.
   2. Painted, metallic-coated steel sheet: 0.028 inch, minimum

D. Provide counterflashing fabricated from the same metal as reglets and compatible with reglet system installed.

E. Provide counterflashing fabricated from the following metal in thickness indicated:
   1. Aluminum Sheet: 0.024 inch thick.
   2. Painted, metallic-coated steel sheet:: 0.028 inch.

(continued on next page)

Guide for Sheet Metal Fascia Edges

(Reprinted from the NRCA Roofing and Waterproofing Manual – Fourth Edition)

Recommended Minimum Gauges for Fascia and Cleat[2]					
Exposed Face Without Brakes "A" Dimension	**Aluminum Alloy (30003-H14)**	**Cold Rolled Copper**	**Galvanized or Coated Steel (G60 & G90)**	**Stainless Steel (302 & 304)**	**Cleat[2]**
Up to 3" Face	.032"	16 oz.	24 ga.	24 ga.	Same gauge as fascia metal
3" to 6" Face	.040"	16 oz.	24 ga.	24 ga.	One gauge heavier than fascia metal
6" to 8" Face	.050"	20 oz.	24 ga.	24 ga.	One gauge heavier than fascia metal
8" to 15" Face	Add brakes to stiffen or use two-piece face	Add brakes to stiffen or use two-piece face	Add brakes to stiffen or use two-piece face	Add brakes to stiffen or use two-piece face	One gauge heavier than fascia metal

Reprinted from SMACNA "Architectural Sheet Metal Manual"

Girth		**Galvanized Steel**		**Copper**		**Aluminum**		**Stainless Steel**	
in.	**mm**	**gage**	**mm**	**oz.**	**mm**	**in.**	**mm**	**gage**	**mm**
Up to 15	Up to 380	26	0.5512	16	0.55	0.032	0.812	28	0.396
16-20	410-510	24	0.7010	16	0.55	0.040	1.016	26	0.477
21-25	530-640	22	0.8534	20	0.69	0.051	1.295	24	0.635
26-30	660-760	20	1.006	24	0.82	0.063	1.295	22	0.795
31-35	790-890	18	1.311	24	0.82			20	0.952
Over 35	Over 890	16	1.613					18	1.270

Table 1-5 Recommended Minimum Gages for Gutter

END OF SECTION

SECTION 077200

ROOF ACCESSORIES

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for accessories installed on or in roofing other than mechanical or structural items.

1.2 QUALITY ASSURANCE

A. Sheet Metal Standard: SMACNA's "Architectural Sheet Metal Manual".

1.3 PRODUCTS

A. Roof Curbs: Galvanized steel, aluminum-zinc alloy-coated steel, prepainted metallic-coated steel, aluminum, or stainless steel.

B. Equipment Supports: Galvanized steel, aluminum-zinc alloy-coated steel, prepainted metallic-coated steel, aluminum, or stainless steel.

C. Roof Hatches: Galvanized steel, aluminum-zinc alloy-coated steel, prepainted metallic-coated steel, aluminum, or stainless steel.

D. Gravity Ventilators: Galvanized steel or aluminum.

LESSONS LEARNED

3.1 Special attention to insulating curbs and ensuring that seams and joints of roof accessories are sealed to prevent air or water infiltration can have a significant effect on the energy efficiency of roof accessories.

END OF SECTION

SECTION 078100

APPLIED FIREPROOFING

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for specialized coatings, mineral fiber, and cementitious coverings to provide the resistance to building components.

1.2 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Provide SFRM with the fire-test-response characteristics as determined by testing identical products per test method indicated by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

B. Product shall contain no detectable asbestos.

1.3 MATERIALS

A. Concealed SFRM: Cementitious or sprayed-fiber.

B. Exposed SFRM
1. Cementitious Type: Dry density not less than 22 lb/cu.ft.
2. Sprayed-Fiber Type: Dry density not less than 22 lb/cu.ft.
3. Water-based intumescent mastic.
4. Non-water-based intumescent mastic.

C. Auxiliary Fire-Resistive Materials:
1. Substrate primers.
2. Bonding adhesive.
3. Expanded metal lath.
4. Reinforcing fabric.
5. Reinforcing mesh.
6. Sealer.
7. Topcoat.

LESSONS LEARNED:

2.1 If primers and lockdown encapsulants are neither listed nor prohibited in the specified fire-resistance design, UL allows the application of SFRM over unknown, primed, and similarly painted wide-flange steel shapes under certain conditions but only after bond tests are performed to compare the bond strength of the SFRM that has been applied over coated steel to that applied over uncoated steel. UL's Fire Resistance Directory, "Coating Materials" Article, which is applicable to wide-flange steel shapes, specifies the bond tests and the conditions where mechanically attaching the SFRM is required. These conditions include wide-flange-beam flange widths exceeding 12 inches, column-flange widths exceeding 16 inches, beam and column web depths exceeding 16 inches, and bond strengths over primed steel falling below the minimum acceptable values. Typically, SFRMs for direct application are tested on galvanized steel deck with a phosphate coating. If other coatings are present, mechanical attachment may be required unless the deck and coating have been UL tested and listed as a painted deck for a specific UL design. Verify, with manufacturers, the chemical compatibility of primers or encapsulants with the SFRM.

2.2 Careful consideration of fire-protection requirements by the entire design team early in the design process can result in integrated designs that may avoid common complaints about and problems with costs, value engineering, substitutions, workmanship, durability, indoor air quality, and failures related to applications of SFRM.

2.3 Several methods, both active (sprinklers) and passive, are possible for protecting steel structures from fire. Designing for fire protection might include dividing a building into isolated modules with a limited number of penetrations for fire-rated doorways, electrical conduits, and ducts. Modules could be protected with SFRM, sprinklers, or both, depending on use, occupancy, potential exposure to abusive environments and individuals, and requirements of authorities having jurisdiction. Costs of sprinkling may be offset by savings from less-restrictive requirements for construction and finishes. Avoiding fire-rated doorways reduces costs for doors, hardware, and signs. Avoiding penetrations for electrical and mechanical work reduces the need for and expense of through-penetration firestop systems, fire-safing insulation, and fire dampers.

2.4 The design of other construction may be dictated by the selection of specific fire-resistance designs in ways that are sometimes unanticipated. For example, selecting assemblies for floor-ceiling designs that are allowed, with restrictions, for roof-ceiling designs, may limit the choice of roofing materials and thickness of the roof insulation.

2.5 Certain surfaces, such as the underside of metal floors and roof decks, may undergo continuous changes in loading or vibration from heavy traffic that could damage SFRM. Excessive deflection and impact forces on steel deck from construction activities and traffic have been identified by manufacturers of SFRM as the leading causes of lack of cohesion/adhesion and bond failure when SFRMs are applied to steel deck. Problems with roof decks surpass problems with floor decks because floor decks are often concrete filled, usually stiffer than roof decks, and less susceptible to impact loads. Manufacturers of SFRM recommend that roofing be completed, penthouse construction be completed, HVAC roof equipment be placed, and construction roof traffic be stopped before applying SFRM. ASTM E 1513 "Practice for Application of Sprayed Fire-Resistive Materials" (SFRMs) states that "SFRM shall be applied after all roof construction, installation of roof-top HVAC equipment, and other related work is completed" and "No SFRM shall be applied to steel deck prior to completion of concrete work on steel deck." AWCI's Recommended Sprayed Fireproofing Industry Standards suggests prohibiting traffic on completed roofing until SFRMs are completely dry and cured. ASTM E 1513 requires that "No roof traffic shall be allowed during application or during the curing period of the SFRM applied to the roof." Excessive construction loads on roof decks can dent and distort the decks and cause damage to applied SFRM. Refer to manufacturers' written recommendations for other guidelines that might influence the choice of above-deck roofing components.

END OF SECTION

SECTION 078400

FIRESTOPPING

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for materials installed in cavities, around penetrations, and openings in floors, walls, partitions, and other building components to prevent spread of fire and smoke.

1.2 QUALITY ASSURANCE

A. Installer Qualifications: An FM Global-approved firestop contractor or a UL-qualified firestop contractor.

B. Fire-Test-Response Characteristics: UL, Intertek ETL SEMKO, or FM Global.

1.3 PENETRATION FIRESTOPPING

A. Penetrations in Fire-Resistance-Rated Walls: F-ratings per ASTM E 814 or UL 1479.

B. Penetrations in Horizontal Assemblies: F- and T-ratings per ASTM E 814 or UL 1479.

C. Penetrations in Smoke Barriers: L-ratings per UL 1479.

D. W-Ratings: Per UL 1479.

1.4 FIRE-RESISTIVE JOINT SYSTEMS

A. Joints in or between Fire-Resistance-Rated Construction: ASTM E 1966 or UL 2079.

B. Joints at Exterior Curtain-Wall / Floor Intersections: ASTM E 119 or ASTM E 2307.

END OF SECTION

SECTION 079200

JOINT SEALANTS

LEED SUGGESTIONS

2.1 LEED Rating: The U.S. Green Building Council's Green Building Rating System for Leed for Schools requires low-emitting materials within the weatherproofing system for Credit EQ 4.1. VOC limits are those listed for Bay Area Air Quality Management District Regulation 8, Rule 51. Although most elastomeric sealants fall easily within VOC limits, special attention should be paid to solvent-release sealants such as acrylic-based and butyl-rubber based products. Primers must also be considered because they typically have a higher VOC rating than the sealants themselves. Exterior sealants are not covered in LEED Credit EQ 4.1.

LESSONS LEARNED

3.1 While joint sealant qualitative requirements are beyond the scope of the Design Manual, they are none the less very important. Joint sealants provide continuity and weathertightness across small gaps in construction and at junctures between dissimilar materials.

3.2 Evaluating joint-sealant performance requires understanding not only sealant properties but also their various modes of failure. These include the following:

A. Adhesive Failure: The sealant loses bond with joint substrates. Sealants must tenaciously grip both sides of a joint, but may require a bond breaker or backer rod to prevent the sealant from adhering to the backing substrate. Adhesion testing prior to construction is recommended. Nonporous, and even some porous substrates, may require priming to improve adhesion. Adhesive failure is caused by the following:

1. Selecting a sealant that is not designed to adhere to the types of joint substrates existing in a project.
2. Improperly formulating or mixing a sealant so that its bonding capacity is not developed.
3. Improper preparation of joint substrates so that the sealant is not allowed to contact and wet sound surfaces. Substrates must be free of moisture, frost, dirt, sealers, paints, form release agents, contamination, corrosion, and degradation. Primer saturation could also prevent the sealant from bonding to substrates.
4. Tensile strength of the sealant exceeds its adhesive strength in the extension cycle. This condition can result from joint widths that are too narrow relative to sealant movement capabilities.
5. Hardening of sealant and loss of elasticity due to age or other causes. This condition can be caused by improper mixing of sealant components. It may occur in joints where initial adhesion is good but deteriorates after one or two years to the point where adhesive failure occurs.
6. Compression set occurs, which refers to a sealant's resistance to return to its former shape during extension after deformation under compression. Because adhesive failures typically do not occur when sealants are compressed but generally occur during extension, the cause is often attributed to poor joint preparation or poor adhesion characteristics of the sealant rather than to the actual cause, compression set. Failure of preformed foamed sealants generally is caused by loss of compression pressure against joint substrates.

B. Cohesive Failure: The sealant fails by tearing within itself while the edges remain adhered to both sides of the joint. The primary reason for cohesive failure is joint movement greater than the joint can accommodate.

C. Spalling Failure: A portion of the joint substrate pulls away with the sealant attached. This may not be the result of a failure of the sealant, but may result if the substrate material is weak or friable. Such failures may occur if the sealant lacks adequate movement capability; the higher the modulus of a sealant, the greater the stress on the bond line.

D. Intrusion Failure: Solid foreign matter intrudes into the sealant after it has necked down during extension and then, during a subsequent compression cycle, abrades the sealant in a manner that causes cohesive failure in a later tension cycle.

E. Reversion: A sealant softens and loses its elasticity, thereby simulating a return to its uncured state. This form of failure is primarily associated with urethane sealants and is defined in ASTM C 717 as “a loss of elastomeric properties and a decrease in durometer hardness of a seal or cured sealant following environmental exposure.” The sealant industry is not currently in agreement as to the cause of reversion or how prevalent the problem is.

F. Crazing: Also called “alligatoring”. This form of failure may be induced by normal deterioration due to weather and can eventually lead to cohesive failure.

G. Bubbling: This condition is caused by gas escaping from the sealant, backer rods, or substrates, and can destroy the sealant’s integrity when bubbles rupture. Moisture in the substrate is a primary cause of bubbling, but it is also often caused by air entrainment during mixing of liquid sealants.

H. Appearance-Related Failures: These failures include bloom, organic growth, color change, and chalking. Bloom is where fluids within the sealant migrate to the sealant’s surface. Organic growth is where algae, mildew, or other microorganisms grow on the sealant’s surface and produce roots, which not only penetrate the sealant but also consume it. Color change results from unstable pigments or an adverse chemical reaction with another chemical in contact with the sealant. Chalking is where powder forms on the sealant’s surface and can indicate disintegration of the base polymer as a result of weathering.

END OF SECTION

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08 DIVISION

OPENINGS

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SECTION 081113

HOLLOW METAL DOORS AND FRAMES

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for hinged doors, fixed panels, and frames manufactured from carbon steel.

1.2 QUALITY ASSURANCE

A. Steel Door and Frame Standard: Comply with ANSI A250.8.

1.3 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A1008, Commercial Steel, Type B; suitable for exposed applications.
   1. Application: Interior, unless otherwise noted.

B. Metallic-Coated Steel Sheets: ASTM A653, Commercial Steel, Type B, with an A60 zinc-iron-alloy (galvannealed) coating; stretcher-leveled standard of flatness.
   1. Application: Exterior openings.

1.4 DOORS

A. Interior Doors: Provide 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 3 and Physical Performance Level A (Extra Heavy Duty), Model 2 (Seamless) or Model 3 (Stile and Rail).

B. Exterior Doors: Provide 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 3 and Physical Performance Level A (Extra Heavy Duty), Model 2 (Seamless) or Model 3 (Stile and Rail).

1.5 FRAMES

A. Frames for Interior Openings: 0.053 inch thick steel (16 gauge).

B. Frames for Exterior Openings: 0.053 inch thick steel (16 gauge).

END OF SECTION

SECTION 081116

ALUMINUM DOORS AND FRAMES

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for hinged or pivoting doors and fixed panels manufactured from aluminum.

1.2 STANDARD FULL GLASS ALUMINUM DOORS

A. Major portions of the door stiles shall be .125 inch in thickness, and glazing molding shall be .050 inch thick.

B. Doors ***Design: Wide stile.***

1. Interior glazing stops shall be square snap-in type with neoprene bulb type glazing. Square stops on exterior side shall be lock-in tamperproof type. No exposed screws shall be required to secure stops.

C. Door shall be weatherstripped on 3 sides with metal backed pile cloth installed in the door and/or frame. An adjustable weatherstrip astragal with stainless steel backing shall be provided at the meeting stiles of a pair of doors.

1.3 FLUSH ALUMINUM DOORS

A. Standard Flush Aluminum Doors, for Manual Swing Operation

1. Provide minimum 1-3/4 inch thick doors constructed from the following:

a. Framing and Hardware Backup: Extruded aluminum tubing, 0.125 inch minimum thickness.

b. Facing; provide one of the following:

1) Seamless aluminum sheet 0.062 inch thick; smooth, ribbed, or pebbled texture; laminated to 0.125 inch tempered hardboard.

2) Seamless aluminum sheet 0.090 inch thick; smooth, ribbed, or pebbled texture.

3) Combined 0.100 inch thick tube shapes with smooth or ribbed texture.

2. Core: Rigid insulating material of not less than 2.0 lb/cu.ft. density.

3. Exterior stops shall be an integral part of the door construction with a minimum wall thickness of .132 inch and minimum height of 3/4 inch. Glazing tape shall be applied to stop prior to installation of glass or panel. Doors shall be interior glazed with 3/4 inch high extruded aluminum snap-in glass stops with a minimum wall thickness of .060 inch with a roll-in gasket.

1.4 HARDWARE

A. Door shall be modified in width for continuous gear hinge installation.

END OF SECTION

SECTION 081416

FLUSH WOOD DOORS

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for hinged doors and fixed panels with flush panel construction; solid cores; wood veneers.
   1. Flush wood doors.

1.2 QUALITY ASSURANCE

A. Quality Standards: WDMA I.S. 1-A.

1.3 INTERIOR SOLID CORE DOORS

A. Grade: Custom grade with “A” faces.

B. Cut: Plain sliced or rotary cut.

C. Match between Veneer Leaves: Book or slip match.

D. Assembly of Veneer Leaves on Door Faces: Running match.

E. Construction: 5-ply construction with particleboard, stave core, or “SCL” structural composite lumber core with stiles and rails glued to core.

F. WDMA I.S. 1-A Performance Grade: Extra Heavy Duty

1.4 FITTING AND FINISH

A. Fitting: Factory prefit and premachine doors.

B. Factory Finish: Transparent factory finish, WDMA TR-4 conversion varnish or TR-6 catalyzed polyurethane.
   1. Grade: Custom

LEED SUGGESTIONS

2.1 Many domestic hardwood species are readily available, and as certified wood, including some that produce strikingly attractive veneers. Cherry, American black walnut, pecan, and butternut provide fine veneers. Brown ash, figured hard maple, red gum, or hickory can also provide fine veneers that are out of the ordinary. Red and white oak, white ash, and American elm also produce fine-quality veneers. Using less well-known tropical species that are not endangered may also be environmentally desirable because it may encourage sustainable forestry. The database “Woods of the World”, Version 2.5, listed in the “References” article in these evaluations, provides information for many lesser-known tropical hardwoods that are not endangered.

2.2 All door core materials use fast-growing, low-density wood species that are typically farmed or removed as weeds from hardwood stands. None require cutting old-growth stands, so environmental implications associated with decisions about core type are generally not critical. For particleboard cores, however, there is a possibility for positive environmental effects, because particleboard is available made from recycled wood as well as from straw, which is an agricultural waste. Recycled content of particleboard can consist of sawdust and scraps from lumber mills or urban wood waste from demolition activities or from tree trimming.

2.3 LEED Rating: The U.S. Green Building Council's (USGBC) LEED for Schools, requires that a minimum of 50% of wood-based materials be certified as having been obtained from forests that comply with FSC STD-01-001, FSC Principles and Criteria for Forest Stewardship, in order for a building to qualify for LEED Credit MR 7. The Section Text includes optional paragraphs to require flush wood doors produced from certified wood and to require documentation of chain of custody for the wood. Note that USGBC will allow credit for the full value of the door as certified wood if the door manufacturer is listed for chain-of-custody certification and at least 70% of the wood materials in the door are from certified forests; otherwise, it only allows credit for the value of the certified wood materials used in making the door.

END OF SECTION

SECTION 081613

FIBERGLASS DOORS ***AND FRAMES***

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for fiberglass reinforced plastic (FRP) doors and frames.

1.2 WARRANTY

A. Materials: 10 years

1.3 MATERIALS

A. Door
1. Door Face Sheets
a. ***Fiberglass reinforced plastic.***
b. Total door thickness to be a nominal 1-3/4 inch.

2. Internal Construction
a. Core
1) ***Rigid Insulation or*** Polyurethane Foam Core (non-rated interior)
2) Mineral Core – fire-rated.
b. Stiles and Rails: Pultruded fiberglass ***or aluminum tubes. Wood is not acceptable.***

B. Door Frames ***(optional)***: High modulus pultruded structural RFP shape.
1. The frame section shall be standard double rabbeted. 5-3/4 inches deep by 2 inch face, 3/16 inch thick, with integral 5/8 inch doorstop, to match typical hollow metal configurations.
2. Design may use either aluminum or fiberglass frames.

END OF SECTION

SECTION 083113

ACCESS DOORS AND FRAMES

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for access doors and panels in walls and ceilings.

1.2 QUALITY ASSURANCE

A. Fire-Rated Vertical Access Doors and Frames: NFPA 252 or ***UL 10 B.***

B. Fire-Rated Horizontal Access Doors and Frames: ASTM E119 or UL 263.

1.3 ACCESS DOORS

A. Frames: minimum 0.060 inch thick sheet steel (16 gauge) with flange suitable for adjacent material.

B. Doors: minimum 0.075 inch thick sheet steel (14 gauge).

C. Door Type
1. Flush panel, unless noted otherwise.
2. Recessed panel, at gypsum wallboard and acoustical ceiling.
3. Fire-rated where indicated.

D. Locking Devices: Cylinder locks where exposed to public.
1. Screw driver latching may be used where access to door is controlled, i.e. janitor's closet.

END OF SECTION

SECTION 083320

OVERHEAD COILING DOORS AND GRILLES

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for doors and grilles that open by folding as an accordion or as a set of panels.
   1. Coiling counter doors.
   2. Overhead coiling doors.
   3. Overhead coiling grilles.
   4. Wood counter shutters.

1.2 QUALITY ASSURANCE

A. Fire Rated Assemblies: NFPA 80, and acceptable testing agency listing.

1.3 COILING COUNTER DOORS

A. Type
   1. Standard counter door.
   2. Fire rated counter door.

B. Door curtain, provide one of the following:
   1. Zinc-coated (galvanized) cold-rolled structural steel (ss) sheet, complying with ASTM A653, G90 coating designation.
   2. Stainless steel, Type 304 Series, ASTM A666.

C. Slat Profile: Flat face slats.

1.4 OVERHEAD COILING DOORS

A. Type
   1. Standard service door.
   2. Insulated standard service door.
   3. Fire rated service door.
      a. Motor operated for testing.

B. Door Curtain, provide one of the following:
   1. Zinc-coated (galvanized) cold-rolled structural steel (ss) sheet, complying with ASTM A653, G90 coating designation.
   2. Stainless steel, Type 304 Series, ASTM A666.

C. Slat Profile: Flat face slats.

1.5 OVERHEAD COILING GRILLES

A. Grille curtain and finish, provide one of the following:
   1. Stainless steel, AISI Type 302/304 with No. 4 satin finish.
   2. Aluminum, ASTM B 221, with clear anodized finish.

3. Hot dip zinc (galvanized), complying with ASTM A123 or electrogalvanized complying with ASTM 653.

LESSONS LEARNED

2.1 Overhead coiling doors, sometimes called rolling doors, include non-insulated, insulated, and fire-rated service doors that have traditionally been used where security, smoke, containment, and fire containment are primary considerations. An advantage of coiling doors is their compact door storage assembly, which is at the head of the opening, frequently above the suspended ceiling height.

2.2 The installation and maintenance of doors and assemblies used to protect openings against the spread of fire and smoke are regulated by NFPA 80. This standard requires door testing and labeling with fire-resistance ratings that requires that fire-rated doors be installed in fire-rated construction. Overhead doors cannot be used to close off a means of egress unless special provisions are made for an emergency pass door within or adjacent to the rated door.

END OF SECTION

SECTION 083613

SECTIONAL DOORS

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for doors that open by moving upward into a nonvertical position, guided on a track.

1.2 PERFORMANCE REQUIREMENTS

A. Operation-Cycle Requirements: Provide sectional overhead door components and operators capable of operating for not less than ***5,000*** cycles.

1.3 SECTIONAL OVERHEAD DOORS

A. Steel Door Sections: Insulated panels.
   1. Frame and Panels: Galvanized (G60) steel frame and steel panels.
      a. ***Steel*** Thickness for Sectional Faces: ***0.040 inch*** thick (20 gauge).
   2. Thermal Insulation

B. Track: Galvanized Steel.

C. Weather Seals.

D. Windows: Optional.

E. Operation: Manual or Electric Door Operator.

1.4 AUXILIARY MATERIALS

A. Automatic reversing control for bottom bar for electric sectional overhead doors.

END OF SECTION

SECTION 084413

GLAZED ALUMINUM CURTAIN WALLS

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for glazed curtain walls with metal framing members.

1.2 QUALITY ASSURANCE

A. Energy Performance: Glazed aluminum curtain walls shall have energy performance ratings per NFRC.
   1. Thermal Transmittance (u-factor): Shall not be less than value determined by Mechanical Engineer by “Building Modeling” in order to meet project’s LEED objectives.

1.3 GLAZED ALUMINUM CURTAIN WALLS

A. Primary Components: Extruded aluminum framing, internal reinforcement, trim, and filler units, sealants, and gaskets.

B. Glazing: Refer to Division 08, Section “Glazing”.

C. Construction: Thermally improved.

END OF SECTION

SECTION 085113

ALUMINUM WINDOWS

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for fixed and operable aluminum framed windows used singly and in multiples.

1.2 QUALITY ASSURANCE

A. Manufacturer shall certify that windows have been tested and conform to AAMA/WDMA 101/I.S.2.
   1. Performance Class: AW Architectural.
   2. Performance Grade: Not less than 60.

B. Energy Performance: Aluminum windows shall have energy performance ratings per NFRC.
   1. Thermal Transmittance (u-factor): Shall not be less than value determined by Mechanical Engineer by “Building Modeling” in order to meet project’s LEED objectives.

1.3 ALUMINUM WINDOWS

A. Window Operation
   1. Projected.
   2. Casement.
   3. Fixed.
   4. Awning.
   5. Top hinged in-swinging windows.

B. Glazing: Insulated with third panel to protect blinds.
   1. Refer to Division 08, Section “Glazing”.

C. Construction: Thermally improved as required to meet energy requirements.

1.4 AUXILIARY MATERIALS

A. Insect Screening: Provide at operable vents.
   1. Aluminum frame.
   2. Screen: Glass-fiber-mesh, aluminum wire, or solar-screening mesh.
   3. Wickets: Sliding or hinged.

B. Integral Louver Blinds: Provide remotely operated horizontal louver blinds in the space between two panes of glass. Construct blinds of aluminum shades, equipped for tilting, raising, and lowering by standard operating hardware located on inside face of sash.
   1. Access Panel: Shall be hinged, lift-off type not acceptable.

END OF SECTION

SECTION 085200

WOOD WINDOWS

GENERAL GUIDELINES

1.1 SECTION INCLUDES
- A. Qualitative requirements for fixed and operable wood framed windows used singly and in multiples.
  - 1. Aluminum or vinyl clad

1.2 QUALITY ASSURANCE
- A. Provide wood windows of performance class and grade indicated that comply with AAMA/NWWDA 101.I.S.2.
  - 1. Performance Class: C minimum.
  - 2. Performance Grade: 30 minimum.
- B. Energy Performance: Aluminum windows shall have energy performance ratings per NFRC.
  - 1. Thermal Transmittance (u-factor): Shall not be less than value determined by Mechanical Engineer by “Building Modeling” in order to meet project’s LEED objectives.

1.3 WOOD WINDOWS
- A. Window Operation
  - 1. Projected.
  - 2. Casement.
  - 3. Fixed.
  - 4. Single-Hung.

1.4 MATERIALS
- A. Aluminum Cladding
  - 1. Trim Members: Provide aluminum-clad wood, hollow-aluminum extrusions, or roll-formed aluminum trim members.
- B. Vinyl Cladding
  - 1. Trim Members: Vinyl-Clad Wood.
- C. Hardware
  - 1. Operating Device: Combination lever handle or crank Cam latch lock.
  - 2. Hinges: Heavy-duty, two-knuckle butt hinges (Minimum of two per ventilator).
- D. Glazing: Insulated with third panel to protect blinds.
  - 1. Refer to Division 08, Section “Glazing”.

1.5 AUXILIARY MATERIALS
- A. Insect Screening
  - 1. Provide at operable vents.
  - 2. Screen: Glass-fiber-mesh or aluminum wire fabric.
  - 3. Wickets: Sliding or hinged.
- B. Integral Louver (Venetian) Blinds: Provide remotely operated horizontal louver blinds in the space between two panes of glass. Construct blinds of aluminum slats equipped to tilting, raising, and lowering by standard operating hardware located on inside face of sash.

END OF SECTION

SECTION 085410

FIBERGLASS WINDOWS

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for fiberglass windows.

1.2 QUALITY ASSURANCE

A. Provide fiberglass windows of performance class and grade indicated that comply with AAMA/NWWDA 101.1.5.2
1. Performance Class: C minimum.
2. Performance Grade: 30 minimum.

B. Energy Performance: ***Fiberglass*** windows shall have energy performance ratings per NFRC.
1. Thermal Transmittance (u-factor): Shall not be less than value determined by Mechanical Engineer by “Building Modeling” in order to meet project’s LEED objectives.

1.3 FIBERGLASS WINDOWS

A. Window Operation
1. Projected.
2. Casement.
3. Fixed.
4. Single-Hung.

1.4 MATERIALS

A. Fiberglass: AAMA 305 glass fiber reinforced thermoset profile.

B. Glazing: Refer to Division 08, Section “Glazing”.

1.5 AUXILIARY MATERIALS

A. Insect Screening
1. Provide at operable vents.
2. Screen: Glass-fiber-mesh or aluminum wire fabric.
3. Wickets: Sliding or hinged.

B. Integral Louver (Venetian) Blinds.

END OF SECTION

SECTION 085656

SECURITY WINDOW SCREENS ***/ GLAZING***

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for security window screens for preventing glass breakage and forced entry.

1. Security glazing may be used in lieu of mesh.

1.2 PERFORMANCE REQUIREMENTS

A. Test Requirements:

1. Comply with test criteria of SMA 6001-2002 ***for screens.***

a. Impact Test: An impact of 50 ft/lbs of force causing a deflection of not more than 3 inches as specified for medium rating.

b. Sag Test: 90 lbs. of weight applied for 5 minutes with a permanent sage of not more than 0/063 inches as specified for heavy rating.

c. Force Entry Test: Three loads of force: A:150 lbs, B: 300 lbs, C:50 lbs applied to screen. As specified for heavy rating.

2. Security glazing shall comply with Forced-Entry Resistance: Class III per ASTM F 1233.

B. Product Certificates ***(screens)***: Certifications, performance and testing must comply with impact, sag, and forced entry resistance requirements of SMA 6001-2002. Manufacturer must submit the AAMA notice of product certification in compliance with CFR 200.935 as “Security Screen-medium”.

1.3 MATERIALS

A. Aluminum Extrusions: All frame and retainer sections shall be extruded aluminum shaped produced from commercial quality 6063-T5 alloy and shall be free from defect that impair strength and durability.

B. Sub Frame: All sub frame members to be made of extruded aluminum alloy with a nominal wall thickness of .062 inches that incorporates an aluminum snap on cover to conceal the installation fasteners. All frame corners to be miter cut and crimped.

C. Hinge: Two hinges shall be located at the jamb opposite of the operating mechanisms. Each hinge shall fit in an aluminum raceway that allows for removal of hinge or adding of hinges without the need of processing to the subframe or screen. The hinges shall be powder-coated pre-assembled 3-wing design made of aluminum, using nylon bushings. Pins, pressure, plates, and screws shall be stainless steel. Grub screw to allow removal of pin, grub screw shall only be accessible once the screen is opened.

D. Screens: Screen to be full configuration and be operable. Screen main frame to be of mitered construction and contain a noise reduction gasket to prevent rattle between main frame and sub frame, frame members and tie bar to have a hollow, with.078 nominal wall thickness. No exposed fastener to the interior or exterior will be acceptable. Screen to lock in a closed secure position by means of a single point release lock.

E. Mesh: Screen cloth to be .028 inch stainless steel 12 x 12 mesh black painted. Each edge of screen to have a 1/2 inch 90 degree bend.

1. Laminated Polycarbonate (option to mesh): Polycarbonate sheets laminated with clear urethane interlayer that complies with ASTM C 1349, Appendix X2, and has a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation. Provide laminated units that comply with requirements of ASTM C 1349 for maximum allowable laminating process blemishes and haze.

F. Locking Mechanism: Provide single handle that activates a cast metal bolt at the sill and a two directional metal lock and keeper mid span of the upper lite.

G. Limit Device: An adjustable arm made of galvanized steel shall be located at the head to limit the screen from swinging open past 90 degrees from the manufacturer, field adjustment shall be possible to accommodate existing conditions. Optional hold open stays are available.

END OF SECTION

SECTION 086300

METAL-FRAMED SKYLIGHTS

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for factory assembled and field assembled aluminum frame skylight systems with insulating glazing consisting of either polycarbonate, heat strengthened and laminated glass units, or translucent fiberglass sandwich panels.

1.2 UNIT SKYLIGHTS

A. Integral Curb: Self-flashing type.

B. Polycarbonate glazing: Thermoformable extruded polycarbonate sheets with a minimum impact strength of 12 foot/lb. Per ASTM D 256, test method A, and burglar resistant per UL 972. UV resistant and double glazed.

C. Insulating Glass:
1. Exterior lite 1/4 inch heat strengthened glass.
2. Interior lite 2 plies 1/8 inch clear, heat strengthened glass with 0.030 clear polyvinyl butyral interlayer.
3. Low E coating.

D. Fiberglass sandwich panel: Manufacturer's standard, uniformly colored, translucent fiberglass reinforced polymer face sheets permanently adhered to a grid core.

E. Aluminum Components.

F. Thermal break.

G. Protective screens when required by Design Team.

1.3 FRAMED SKYLIGHTS

A. Framing Materials: Aluminum.
1. Extrusions: ASTM B221.
2. Sheet and plate: ASTM B 209.
3. Bars, rods, and wire: ASTM B 211.

B. Polycarbonate Insulating Panels: Double layer, minimum 2.2 inches thick, U value of not more than 0.26 per ASTM C 236.

C. Insulating Glass
1. Exterior lite: Heat strengthened glass.
2. Interior lite: Clear laminated glass.
3. Low-E coating.

D. Fiberglass Sandwich Panels: Manufacturer's standard, uniformly colored, translucent, fiberglass reinforced polymer sheets permanently adhered to a grid core.

1.4 INSTALLATION

A. Install unit skylights according to construction details of NRCA's "The NRCA Roofing and Waterproofing Manual".

END OF SECTION

SECTION 087100

DOOR HARDWARE

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for hinges, pivots, sliding and folding door hardware, and other hanging hardware; locks, exit devices, cylinders and other latching hardware; closers, holders, self-closing hinges and other controlling hardware; and push plates, pulls, kickplates, and other door trim.

1.2 QUALITY ASSURANCE

A. Hardware for Fire Rated Openings: NFPA 80, and local requirements.

B. Handicapped Accessibility: ANSI A117.1, and local requirements.

C. Materials and Application: ANSI A156 series standards.

1.3 DOOR HARDWARE

A. Quality Level: Grade 1, ANSI/BHMA A156.

B. Locksets and Latchsets: Mortise type.

C. Lock Cylinders: Interchangeable or recodeable type.

D. Keying: Owner's requirements keying and key control system.

E. Hinges and Butts: Full mortise type with nonremovable pins at exterior doors.

F. Closers, Door Control, and Exit Devices
   1. Grade 1 devices.

G. Pivots: Offset or center hung type.

H. Push/Pull Units: Through bolted type.

I. Hardware Finishes
   1. Satin chrome.
   2. Polished stainless.
   3. Satin stainless.

1.4 AUXILIARY MATERIALS

A. Door Trim Units: Kickplates, edge trim, and related trim.
B. Stops and overhead door holders.
C. Soundstripping.
D. Weatherstripping and thresholds.
E. Electromagnetic hold open devices.

LEED SUGGESTIONS

2.1 LEED for Schools requires Minimum Acoustical Performance as a prerequisite for Indoor Environmental Quality. This may require sound gasketing of the doors. The Design Team is encouraged to study this prerequisite carefully so as to avoid not being able to obtain certification by failing to meet the requirements of the prerequisite.

2.2 Selection of the proper type and quality of gasketing materials for exterior door openings can have a significant effect on energy savings for the building. The seal should be continuous around the entire perimeter of the door. High-quality closers should also be used on exterior doors to ensure that no door is inadvertently left open.

2.3 Thresholds with thermal breaks should be considered. Avoid creating conditions that interfere with the operation of other door hardware. Do not overlook difficulties that people with disabilities might encounter when using the door. Door gasketing must also be coordinated with door and frame types because benefits gained through using quality gasketing can be lost if the door does not have similar thermal performance capabilities.

LESSONS LEARNED

3.1 Carefully review OSFC's requirements for three manufacturers with your Door and Hardware consultant.

END OF SECTION

SECTION 087113

AUTOMATIC DOOR OPERATORS

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for an automatic door operator is the operating mechanism attached to a door for the purpose of mechanically opening and closing a door upon the receipt of an actuating signal.
   1. Application: Provide a minimum of one at main entrance.

1.2 AUTOMATIC DOOR OPERATOR

A. Electromechanical Operating System: Unit powered by permanent magnet dc motor; with closing speed controlled mechanically by gear train and dynamically by braking action of electric motor, and with manual operation including spring closing with power off.

LESSONS LEARNED

2.1 Indicate doors to receive automated openers on the Door Schedule.

END OF SECTION

SECTION 088000

GLAZING

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for transparent and translucent glass for general and special purpose applications.

1.2 QUALITY ASSURANCE

A. Comply with applicable codes and regulations and with the Consumer Product Safety Commission CPSC 16 CFR 1201 and with applicable recommendations of Flat Glass Marketing Association (FGMA) "Glazing Manual."

B. Energy Performance: Glazing shall combine with framing to achieve rating per NFRC.
1. Thermal Transmittance (u-factor): Shall not be less than value determined by Mechanical Engineer by “Building Modeling” in order to meet project’s LEED objectives.
2. When selecting windows, utilize the following chart to determine the best window for each application and exposure:

Application	**Exposure**	**Type**
View Glass (non-daylighting apertures)	South	clear double, low-e
	North	clear double, low-e
	East/West, unshaded	tinted double, low-e
	East/West, shaded	clear double, low-e
Windows above lightshelves	South	clear double
High windows above view glass	North	clear double
Roof monitor	South	clear double
Blinds-between-glazing	South	Clear double with blinds in sealed assembly. Clear double plus an additional glazing with blinds between double assembly and additional single glazing.

1.3 GLASS

A. Primary Glass Products.

B. Heat Treated Glass Products.

C. Laminated Glass Units.

D. Sealed Insulating Glass Units
1. Provide low-emissivity-coated insulating glass units**,** where required to meet energy requirements.

E. Fire-Rated Glazing Products; Provide any of the following as required to meet performance conditions:
   1. Specialty Tempered Monolithic Glass
   2. Laminated Ceramic Glazing Material
   3. Laminated Glass with Intumescent Interlayer
   4. Gel-Filled, Dual-Glazed Units
   5. Wire glass of any form is not acceptable.

1.4 GLASS USAGE

A. Exterior

1. Glass for Exterior Doors
   a. 1 inch thick insulated glass with optional low-e coating.
2. Exterior Sidelights, Transoms, Storefront, and Curtainwall: Shall be 1 inch thick insulated glass consisting of 1/4 inch thick, outer panel, a 1/2 inch wide hermetically sealed air or gas space, and 1/4 inch clear glass inner panel.
3. Windows
   a. Glazing: Shall be triple glazed consisting of 1 inch thick insulated outer unit comprised of 1/4 inch outer panel, 1/2 wide hermetically sealed air or gas space, and 1/4 inch thick clear inner panel and an air space of sufficient size to accommodate a blind assembly, and 1/4 inch clear inner panel, hinged to provide access to blind assembly. 1 inch insulated panel shall be factory installed. Optional low-e coating.
4. Sound Rated Glazing (35 or better)
   a. Kind LT, consisting of two lites of fully tempered float glass.
   b. Outer Lite: Class 1 float glass.
      1) Thickness: 6.0 mm, minimum
   c. Inner Lite: Class 1 float glass.
      1) Thickness: 6.0 mm.
   d. Plastic Interlayer
      1) Thickness: 0.060 inch, but not less than that required to comply as a Type II safety glass material.
      2) Color: Clear, unless otherwise noted.
5. Ceramic-Coated Spandrel Insulating Glass
6. Laminated Glass for Skylights and Sloped Glazing
   a. Glazing shall be 1-1/4 inch thick insulated glass consisting of 1/4 inch thick outer panel, 1/2 inch wide hermetically sealed air or gas space, and 1/2 inch thick laminated glass inner panel.
      1) Laminated Glass: Kind LT, consisting of two lites of fully tempered float glass.
         a) Inner and Outer Light: Type I (transparent glass, flat) float glass.
            .1 Class I.
            .2 FT (fully tempered).
            .3 Thickness: 6 mm.
         b) Plastic Interlayer: 0.060 inch thick.
      2) Low Emissivity Coating: Optional.

B. Interior
1. Glass for Vestible Doors, Sidelights, and Transoms: 1/4 inch thick clear tempered glass.
2. Glass for Interior Fire Rated Doors and Windows: 1/4 inch fire-rated glazing product.
3. Glass for Interior Non-Fire Rated Doors and Windows: 1/4 inch clear tempered safety glass.
4. Sound Rated Doors (30 or better)
   a. Kind LT, consisting of two lites of fully tempered float glass.
   b. Outer Lite: Class 1 clear float glass.
      1) Thickness: 6.0 mm.
   c. Inner Lite: Class 1 clear float glass.
      1) Thickness 6.0 mm.
   d. Plastic Interlayer
      1) Thickness: 0.060 inch, but not less than that required to comply as a Type II safety glass material.
      2) Color: Clear, unless otherwise noted.
         a) Provide a semi-transparent film, where privacy is indicated.

LEED SUGGESTIONS

2.1 Carefully selecting glass and associated elements of the wall system can drastically reduce energy consumption for both winter and summer seasons. There is no simple set of instructions for absolute analysis of the situation; a range of considerations is involved.

A. Although it has been estimated that only 4% of the total energy consumption in the U.S. is heat transferred through building window glass, every source of conservation is worthy of consideration. The general public easily recognizes the window-glass heat-loss problem.

2.2 Coatings on glass are an important part of the overall capability now available for minimizing heat transmission through vision lites. Their effectiveness depends on many factors, which are explained and documented in published product literature and other publications. Solar-control low-e coatings maximize the amount of daylight transmitted through the glass, while minimizing both the amount of solar heat transmitted into the building and the amount of heat loss from the long-wave infrared portion of the heat spectrum (radiant heat generated by electric coil-type heat and sensible heat from air-handling systems). For most commercial buildings, regardless of climate, in which the primary concern is reducing the solar heat gain, the coating's location is of less concern, and placing it on either the second or third surface should remain an option; for units with clear glass on both outdoor and indoor lites, the low-e coating is typically placed on the second surface.

2.3 LEED for Schools Credit Energy and Atmosphere (Optimize Energy Performance) provides up to 10 points for improving the building performance rating compared to the baseline building performance rating per ASHRAE/IESNA 9.0.1-2004. Selecting glass to reduce energy losses through fenestration and energy consumption for cooling that is caused by solar heat gain through fenestration can help contribute toward earning some of those points. Additionally, credits for Indoor Environmental Quality that can be obtained for daylighting will be affected based on the amount and location of fenestrations. Glass selection is a factor affecting "daylighting" because it is a function of visible light transmittance.

END OF SECTION

SECTION 088300

MIRRORS

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for unframed mirrors.

1.2 PRODUCTS

A. Glass Mirrors: ASTM C 1503.

B. Clear Glass: Nominal thickness of 6.0 mm.

C. Miscellaneous Materials: Setting blocks, edge sealer, and mirror mastic.

D. Mirror Hardware: Bottom aluminum J-channels and top aluminum J-channels.

E. Mirror Edges: Rounded polished or beveled polished.

END OF SECTION

SECTION 089000

LOUVERS AND VENTS

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for exterior wall louvers.

1.2 QUALITY ASSURANCE

A. Wind Loads: Minimum 29 lb/sq.ft.

1.3 PRODUCTS

A. Fixed, Extruded-Aluminum Louvers
1. Exterior
a. Horizontal Storm-Resistant Louver.
b. Vertical Storm-Resistant Louver.
c. Horizontal, Drainable-Blade Louver.
d. Horizontal, Continuous-Line, Drainable-Blade Louver.
2. Interior
a. Horizontal, Nondrainable-Blade Louver.
b. Vertical, Sightproof, Louver.
c. Fixed, Acoustical Louver.

B. Louver Screens
1. Provided at each exterior louver.
2. Screening Type: Bird screening.

C. Blank-Off Panels: Uninsulated or insulated.

D. Wall Vents (Brick Vents): Extruded or cast aluminum.

END OF SECTION

09 FINISHES

DIVISION

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SECTION 092116

GYPSUM BOARD ASSEMBLIES

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for non-structural metal support assemblies for gypsum board and interior gypsum board, gypsum board assembles, accessories, and trim.

1.2 QUALITY ASSURANCE

A. Refer to "Recommended Specification on Levels of Gypsum Board Finish" as published by the Gypsum Association (and AWCI/CISCA/PDCA) for finish levels required.

B. Recommended deflection limit for gypsum board assemblies is L/240.
1. Tile finishes applied to cementitious backer units will require deflection limits of L/360 or less.

1.3 STEEL FRAMING

A. Steel Framing, General: Comply with ASTM C 754 for conditions indicated.
1. Steel Sheet Components: Metal complying with ASTM C 645 requirements.
a. Protective Coating:
1) Interior Applications: ASTM A 653, G40 (Z120), hot-dip galvanized zinc coating.

B. Partition and Soffit Framing:
1. Steel Studs and Runners
a. Minimum Base Metal Thickness: .0312 inch or equivalent thickness
2. Slip-Type Head Joints
a. Double Runner
b. Deflection Track
c. Firestop Track
3. Flat Strap and Bracing Plate
4. Cold-Rolled Channel Bridging
5. Flat-Shaped, Rigid Furring Channels
6. Cold-Rolled Furring Channels
7. Z-Shaped Furring

C. Suspension Systems
1. Wire Hangers
2. Flat Hangers
3. Carrying Channels
4. Furring Channels
5. Grid Suspension Systems for Ceilings

1.4 PANEL PRODUCTS

A. ***Interior*** Gypsum Wallboard: 5/8 inch minimum thickness, Type X.

1. Abuse Resistance Wall Board: ASTM C1629

Level	Description	Performance Types			
		Abrasion (ASTM D4977)	Indentation ***(ASTM D5420)***	Hard-Body Impact ***(Annex A1)***	Soft-Body Impact ***(ASTM E695)***
1	A basic upgrade to standard drywall. Provides improved resistance to incidental surface and impact damage.	***0.126 inch***	0.15 inch	***50 ft-lbs.***	***90 ft-lbs.***
Application Recommendation: Primary grade classrooms					
2	Provides moderate resistance to incidental surface and impact damage from people and objects.	***0.059 inch***	***0.10 inch***	**100 ft-lbs.**	***195 ft-lbs.***
Application Recommendation: Middle ***and*** high school classrooms					

2. Moisture and Mold Resistant Gypsum Wallboard: Moisture and mold-resistant core and surfaces. Gypsum board shall be designed to provide extra protection against mold and mildew compared to standard paper-faced wall board products. When tested by an independent lab per ASTM D 3273 ("Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber") gypsum board shall achieve an average panel score of 8 or greater out of a possible high score of 10.

B. Tile-Backing Panels

1. Cementitious Backer Units

a. Application: Provide as tile backer at all "wet walls".

2. Glass-Mat, Water-Resistant Backing Board

1.5 TRIM ACCESSORIES

A. Interior Trim

1. Cornerbead: Use at outside corners.
1. LC-Bead: Use at exposed panel edges.
2. Expansion (Control) Joint: Maximum 30 ft. o/c.

1.6 JOINT TREATMENT MATERIALS

A. Joint Tape

B. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, flanges of trim accessories, and fasteners, use setting-type taping compound.
3. Fill Coat: For second coat, use drying-type, all-purpose compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.
5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.

1.7 AUXILIARY MATERIALS

A. Sound Attenuation Blankets

LEED SUGGESTIONS

2.1 LEED for Schools provides a credit under Interior Environmental Quality for specifying low-emitting materials for gypsum board, insulation, acoustical ceiling systems, and wall coverings.

LESSONS LEARNED

3.1 Mold-related claims against building owners are increasing. Reasons asserted for the increase in mold-related lawsuits include tighter building envelopes that hinder the escape of moisture, the use of building materials with organic components that "feed" mold (such as paper facings on gypsum board), shorter construction schedules that sequence finish work before the interior environment is conditioned, and inadequate protection of construction materials before, during, and after installation. Requirements for installing interior gypsum products in semi-conditioned spaces need consideration.

END OF SECTION

SECTION 092400

PORTLAND CEMENT PLASTERING

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for interior and exterior plastic (stucco) finishes, including furring, lathing, accessories, and trim for plaster.

1.2 FRAMING/METAL LATH

A. Lath and Plaster Support Systems
1. Metal Supports for Suspended and Furred Ceiling: ASTM C 1063.
2. Steel Studs and Runners, Nonload (Axial) Bearing: ASTM A 645-00, G60.
3. Expanded Metal Lath: ASTM C 847, self-furring diamond mesh or rib lath; ASTM A 653 G60.
4. Woven Wire Lath: ASTM C 1032, galvanized steel wire.
5. Welded Wire Lath: ASTM C 933, galvanized steel wire.

1.3 PORTLAND CEMENT PLASTER

A. Application
1. 3 coats over metal lath type.
2. 3 coats over concrete unit masonry type.

1.4 ACCESSORIES

A. Accessories: ***Zinc-coated (galvanized) steel.***

END OF SECTION

SECTION 092513

ACRYLIC PLASTER CEILINGS

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for factory mixed acrylic emulsion coating systems, formulated with colorfast mineral pigments and fine aggregates for use over sheathing for high humidity and abuse ceiling ***and exterior soffit*** applications.

1.2 SHEATHING

A. Glass-Mat Gypsum Backing Board.

B. Exterior Cement Board.

C. Tile Backer.

1.3 FINISH SYSTEM – MATERIALS

A. Reinforcing Mesh: Nominal 4.2 oz./sq.yd., symmetrical, interlaced open weave glass fiber fabric.

B. Base Coat: Acrylic based, fiber reinforced, flexible waterproofer.

C. Primer: A synthetic resin, pigmented, copolymer based primer. Tint to same shade as finish.

D. Finish Coat Materials: Manufacturer's siliconized acrylic based coating complying with the following requirements for material composition and method of combined materials:

1. Factory mixed formulation of polymer emulsion binder, colorfast mineral pigments, sound stone particles, and fillers.

END OF SECTION

SECTION 093000

TILING

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for manufactured surfacing units of impervious, vitreous, semi-vitreous, and non-vitreous materials; glazed, unglazed, abrasive, and textured surfaces and related mortar, grout, trim, antifracture membranes and accessories.

1.2 QUALITY ASSURANCE

A. Tile Council of North America (TCA) "Handbook for Ceramic Tile Installation" shall be used as a guide to assist in standardizing installation specifications.

B. ANSI Ceramic Tile Standard: Provide tile that complies with A137.1, "Specifications for Ceramic Tile".

C. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI Standards referenced in "Setting and Grouting Materials" Article.

1.3 UNGLAZED CERAMIC MOSAIC TILE

A. Type: Porcelain factory-mounted flat tile with abrasive admixture at wet areas.

B. Thickness: 1/4 inch nominal.

C. Face: Plain face with cushion edges.

1.4 GLAZED CERAMIC MOSAIC TILE

A. Type: Porcelain factory-mounted flat tile.

B. Thickness: 1/4 inch nominal.

C. Face: Plain face with cushion edges.

1.5 UNGLAZED QUARRY TILE

A. Wearing Surface: Provide one of the following:
   1. Nonabrasive, smooth
   2. Nonabrasive, textured
   3. Abrasive aggregate embedded in surface

B. Thickness: 1/2 inch nominal

C. Face: Plain or patterned face

1.6 UNGLAZED PAVER TILE

A. Composition: Porcelain

B. Thickness: 3/8 inch nominal

C. Face: Plain with square or cushion edges

1.7 GLAZED WALL TILE

A. Type: Interior type body, flat tile.

B. Thickness: 5/16 inch nominal.

C. Face: Plain face with modified square or cushion edges.

1.8 SETTING MATERIALS

A. Portland Cement Mortar: ANSI A 108.1A.

B. Dry-Set Portland Cement Mortar: ANSI A 118.1.

C. Latex-Portland Cement Mortar: ANSI A 118.4.
1. Prepackaged dry mortar mix.

D. Chemical-Resistant, Water-Cleanable, Tile-Setting and Grouting Epoxy: ANSI A 118.3.

E. Water-Cleanable, Tile-Setting Epoxy Adhesive: ANSI A 118.3.

1.9 GROUT

A. Sand-Portland Cement Grout: ANSI A 108.10.

B. Polymer – Modified Tile Grout: ANSI A 118.7.

C. Standard Sanded Cement Grout: ANSI A 118.6.

D. Standard Unsanded Cement Grout: ANSI A 118.6.

E. Chemical-Resistant, Water-Cleanable, Tile-Setting and Grouting Epoxy: ANSI A 118.3.

1.10 WATERPROOFING AND CRACK-SUPPRESSION MEMBRANES FOR THIN-SET TILE INSTALLATIONS

A. Manufacturer's standard product that complies with ANSI A 118.10.

1.11 ACCESSORIES

A. Metal Edge Strips: Provide at tile transitions to protect edge of tile.

B. Elastomeric Sealants: One-Part, Mildew-Resistant Silicone Sealant.

1.12 INSTALLATION, GENERAL

A. ANSI Tile Installation Standards: Comply with parts of ANSI A 108 Series "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.

1.13 SETTING METHODS

A. Method and typical detailing for tile work shall be in accordance with the following TCA alphanumeric method, listing from the "Handbook for Ceramic Tile Installation," latest edition, by the Tile Council of America.

WALL TILING INSTALLATION GUIDE

(Reprinted from the 2005 Handbook for Ceramic Tile Installation, 42nd Edition)

Simplest methods are indicated; those for heavier services are acceptable. Very large or heavy tiles may require special setting methods. Consult ceramic tile manufacturer.

SERVICE REQUIREMENTS	**WALL TYPE (numbers refer to Handbook method numbers)**					
	Masonry or Concrete	Page	Woods Stud	Page	Metal Studs	Page
Commercial Construction – Dry or limited water exposure: dairies, breweries, kitchens	W202 W221 W223	41 42 42	W223 W231 W243 W244 W246	42 44 45 46 47	W223 W241 W242, W243 W244 W246	42 44 45 46 47
Commercial Construction – Wet: gang showers, tubs, showers, laundries	W202 W211 W221	41 43 42	W231 W244 W246 B411 B414	44 46 47 50 52	W241 W244 W246 B411 B414, B415 B425 B426	44 46 47 50 52 51 53

WALL TILING INSTALLATION GUIDE

(Reprinted from the 2005 Handbook for Ceramic Tile Installation, 42nd Edition)

Performance – Level Requirement Guide and Selection Table

Based on results from ASTM Test Method C-627 "Standard Test Method for Evaluating Ceramic Floor Tile Installation Systems Using the Robinson Type Floor Tester." All methods are material dependent – performance rating should not exceed rating of weakest component – consult each material manufacturer for individual component rating.

SERVICE REQUIREMENTS Find required performance level and choose installation methods that meets or exceeds it. Performance results are based on ceramic tile meeting ANSI A137.1, or tile designated by tile manufacturer.	FLOOR TYPE – Numbers refer to Handbook Method numbers	
	Concrete	**Page**
Heavy: Shopping malls, stores, commercial kitchens, work areas, laboratories, auto showrooms and service areas, shipping/receiving, and exterior decks. (Passes ASTM C627 cycles 1 through 12)	F103, F111, F112 F113, F121	17, 18, 19 19, 22
Moderate: Normal commercial and light industrial use in public space of restaurants and hospitals. (Passes ASTM C627 cycles 1 through 10.)	F112, F115 F122 [c], F200 RH110, RH111 RH115, RH116	19, 20 22, 21 26, 27 27,28
Light: Light commercial use in office space, reception areas, kitchens, and bathrooms. (Passes ASTM C627 cycles 1 through 6.)	F122[c]	22

END OF SECTION

SECTION 095113

ACOUSTICAL PANEL CEILINGS

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for ceiling panels and ceiling suspension assemblies.

1.2 QUALITY ASSURANCE

A. Acoustical Panel Quality Standard: ASTM E 1264.

B. Metal Suspension System Quality Standard: ASTM C 635.

1.3 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at levels for intended use.

1.4 MINERAL BASE PANELS, WATER FELTED

A. Type, form and finish, provide one of the following:
1. ASTM E 1264, Type III or IV, Form 1 or 2 with painted finish.

1.5 PANELS WITH SCRUBBABLE FINISH (CLEANABLE)

A. Type: ASTM E 1264, Type XX or IV, or gypsum based panel.
1. USDA approved kitchens.

1.6 CEMENTITIOUS FIBER BOARD CORE

A. Type form and finish, provide one of the following:
1. ASTM E 1264, Type XIV, Form 1 (No Backing) or Form 2 (Backed with mineral or glass fiber backing), pattern I (random swirl).

1.7 SUSPENSION SYSTEMS

A. ***Metal Suspension Systems***
1. Wire hangers, braces, and ties.
2. Angle hangers.
3. Seismic perimeter stabilizer bars, struts, and clips, if required by seismic zone.
4. Hold-down clips (vestibules, restrooms).
5. Impact clips.
6. Wide-face, capped, double-web steel: Intermediate duty.
7. Wide-faced, capped, double-web, hot-dip galvanized steel: Intermediate duty.

LEED SUGGESTIONS

2.1 Acoustical Panel Ceilings if specified correctly can contribute to several LEED Credits.

A. Construction Waste Management: Most manufacturers have a take-back program eliminating construction waste for these products.

B. Low-Emitting Materials: Ceiling products can be selected that will comply with California Section 01350 requirements for low emissions.

C. Daylight and Views: Highly reflective surfaces can increase daylighting effectiveness.

D. Minimum Acoustical Performance and Enhanced Acoustical Performance: Careful review of NRC, AC, and CAC can assist in obtaining the prerequisite as well as a credit.

LESSONS LEARNED

3.1 Light reflectances for most standard products fall within the top range of 0.75 LR or greater. Lower values are typical for some textured, embossed, or scored patterns; nonwhite units; and those covered with fabric. This lower reflectance is not necessarily significant, however, unless the ceiling is depended upon as a distributor of ambient illumination. Ceiling light reflectance performance is especially important in buildings with substantial levels of indirect lighting, and in building designs incorporating daylighting. Using daylight as a lighting source often requires directing a portion of the daylight toward the ceiling for subsequent re-reflection and diffusion. This strategy may be used to deliver uniform, usable light levels without glare throughout the illuminated space.

3.2 Resistance to humidity varies among acoustical ceiling components. Most regular composition tiles and panels deteriorate when exposed to high humidity or humidity fluctuation. High-density, ceramic ceiling panels are specifically recommended for high-humidity conditions, as are vinyl-film-faced and metal-foil-faced products. Acoustical units designed not to sag in high-temperatures as high as 104 degrees F (40 degrees C), and high-humidity (90% to 100% relative humidity) conditions, are available. Similar care must be exercised when selecting suspension system components for high-humidity areas, including areas such as saunas, shower rooms, indoor swimming pools, and kitchens. Also, to reduce moisture-related problems, make provisions for ventilating the ceiling plenum.

3.3 Installing thermal or acoustical insulation on the back of suspended acoustical panel ceilings is not recommended by manufacturers. Excessive loading caused by added insulation can cause sagging and unsafe installations. Condensation may occur if ceiling insulation places the dew point inside the plenum. Condensation within the plenum can damage both acoustical units and suspension systems. Uncovered mineral-fiber insulation in the plenum may increase particulate counts in air supplies and contribute to poor indoor air quality. If other considerations require that acoustical or thermal insulation be installed on top of the acoustical ceiling, manufacturers may not warrant installations or they may have weight restrictions, requirements for vapor retarders, and other limitations. Because blanket insulation rolls span multiple cross tees and contacts the backs of acoustical units less frequently, rolls are preferred to batts.

END OF SECTION

SECTION 096400

WOOD FLOORING

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for wood strip flooring and finish.

1.2 QUALITY ASSURANCE

A. Hardwood Flooring: Comply with NOFMA's "Offical Flooring Grading Rules" for species, grade, and cut.

B. Maple Flooring: Comply with applicable MFMA grading rules for species, grade, and cut.

C. Softwood Flooring: Comply with WCLIB No. 17 grading rules for species, grade, and cut.

1.3 WOOD STRIP FLOORING FOR GENERAL USE (STAGE / PLATFORM)

A. Solid-Wood, Strip Flooring.
   1. Species and Grade: Hardwood.
      a. No. 2 common red oak
      b. MFMA-RL Second and Better Grade hard maple
   2. Cut: Plain sawn, quarter/rift sawn, or edge grain
   3. Thickness: 25/32 inch minimum.

B. Solid-Wood Plank Flooring:
   1. Species and Grade: Softwood.
      a. C and better or D – Flooring Douglas Fir
   2. Cut: Plain sawn.
   3. Thickness: 3/4 inch nominal.

C. Field-Applied Finish: Solvent-based, oil-modified, or water-based urethane finish system.

1.4 ACCESSORIES

A. Wood Sleepers and Subfloor.

B. Wood Underlayment.

C. Cork Expansion Strip.

D. Wood Trim.

E. Vented Base.

1.5 PREPARATION

A. Concrete Slabs: Verify that slabs are dry according to test methods recommended by flooring manufacturer or, if none, by test methods in NOFMA's "Installing Hardwood Flooring."

1. When concrete slabs are tested according to ASTM F 1869, Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride, 4-1/2 pounds of water/1000 sq.ft. of slab in a 24hour period is generally acceptable as a maximum moisture-emission level.

LEED SUGGESTIONS

2.1 LEED for Schools requires that a minimum of 50% of wood-based materials be certified as having been obtained from forests that comply with FSC STD-01-001, FSC Principles and Criteria for Forest Stewardship in order for a project to qualify for Credit MR7.

LESSONS LEARNED

3.1 The Maple Flooring Manufacturers Association (MFMA) has noted that the use of water-based finishes has occasionally produced a side bonding effect, which may result in localized excessive cracks between boards. They recommend consulting an MFMA contractor and the manufacturer to obtain procedures for sealing and finishing maple strip flooring with water-based products.

END OF SECTION

SECTION 096466

WOOD ATHLETIC FLOORING

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for wood sports-floor assemblies.

1.2 QUALITY ASSURANCE

A. Maple Flooring: NFMA.

1.3 WOOD STRIP FLOORING FOR ATHLETIC APPLICATION

A. Strip Flooring: Northern hard maple, kiln dried, random length, tongue and groove, and end matched.
   1. Grade: MFMA-RL, provide Second and Better Grade or Thirds for areas normally exposed to view in high schools only.
      a. Provide Third Grade for areas under stacked portion of telescoping bleachers and at middle schools.
   2. Cut: Edge or Flat
   3. Thickness: 25/32 inch
   4. Face Width: 2-1/4 inches or 1-1/2 inches
   5. Backs: Channeled (kerfed) for stress relief

B. Installation System: Provide one of the following:
   1. Maple, strip flooring on floating double layer, plywood subfloor.
   2. Maple, strip flooring on floating wood sleepers.
   3. Maple, strip flooring on fixed, wood sleepers and subfloor.

C. Finish: High build gym floor finish and game markings, approved by Maple Flooring Manufacturers Association (MFMA).
   1. Type: MFMA Group 3, Gymnasium Type (Surface) Finishes; urethane-oil type or Group 5, Water Based Finishes; polyurethane
   2. Floor-Sealer Formulation: Pliable, penetrating type
   3. Finish-Coat Formulation: Formulated for gloss finish and multi-coat application
   4. Game-Line and Marker Paint: Industrial enamel compatible with finish coats and recommended in writing by manufacturers of finish coats, and paint for this use.

1.4 AUXILIARY MATERIALS

A. Vented Cove Base: Semi-rigid plastic angle molding.

1.5 PREPARATION

A. Where direct application of wood flooring to concrete substrate is indicated, test for dryness before proceeding with installation. Check levelness of concrete substrate to ensure not more than 1/8 inch deviation in any direction when checked with a 10 foot straight edge. Grind down high spots or fill in low spots to correct improper conditions.

B. Concrete Slabs: Verify that slabs are dry according to test methods recommended by flooring manufacturer or, if none, by test methods in NOFMA's "Installing Hardwood Flooring."

1. When concrete slabs are tested according to ASTM F1869, Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride, 4-1/2 pounds of water/1000 sq.ft. of slab in a 24 hour period is generally acceptable as a maximum moisture-emission level.

LEED SUGGESTIONS

2.1 VOC restrictions of authorities having jurisdiction may affect the selection of installation adhesives and floor-finish systems. The Section Text places responsibility on the floor covering manufacturers for selecting appropriate adhesives and floor-finish systems for conditions indicated. The Section Text also includes requirements for low-emitting adhesives required for LEED Credit EQ 4.1 and low-emitting finish systems required for LEED Credit EQ 4.2.

2.2 LEED Credit MR 7 requires that a minimum of 50% of wood-based products be from forests certified by an FSC-accredited certification body to comply with FSC 1.2, Principles and Criteria.

LESSONS LEARNED

3.1 The Maple Flooring Manufacturers Association (MFMA) has noted that the use of water-based finishes has occasionally produced a side bonding effect, which may result in localized excessive cracks between boards. They recommend consulting an MFMA contractor and the manufacturer to obtain procedures for sealing and finishing maple strip flooring with water-based products.

END OF SECTION

SECTION 096500

RESILIENT FLOORING

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for resilient tile flooring, resilient sheet flooring, resilient base, resilient stair treads and risers, resilient stair nosings, resilient edging, and transitions for carpet.

1.2 QUALITY ASSURANCE

A. Fire Test Performance: Unless otherwise indicated, provide flooring material to meet the following fire test performance criteria as tested by a recognized independent testing laboratory.
   1. ASTM E 648 (Critical Radiant Flux) of 0.45 watts per sq.cm. or greater, Class I.
   2. ASTM E 662 (Smoke Generation) Maximum Specific Optical Density of 450 or less.

B. Provide adequate testing of concrete slabs, including relative humidity testing.

1.3 TILE FLOORING

A. Vinyl Composition Tile: ASTM F 1066, Class 2 (through pattern tile), 12 by 12 inches by 0.125 inch thick, minimum.

B. Enhanced Tile: Exceeds ASTM F 1066 ***(includes Quartz tiles and tiles modified for non-vinyl compound)***, 12 x 12 inches minimum by ***.080 inch*** thick minimum.
   1. Static Load: ASTM F 970; ***400 psi***, minimum.
   2. Finish (optional)
      a. UV/ceramic coating technology.
      b. Polyurethane coating.

C. Rubber Tile: ASTM F 1344, Class 1-A or 1-B, 0.125 inch thick.

D. Solid Vinyl Floor Tile: ASTM F 1700.
   1. Thickness: 0.120 inch minimum.

1.4 VINYL SHEET FLOORING

A. Unbacked Sheet Vinyl Floor Covering: ASTM F 1913, 0.080 inch thick.

B. Sheet Vinyl Floor Covering with Backing: ASTM F 1303, 0.080 inch thick.

1.5 RUBBER SHEET FLOORING

A. Provide three-layer construction rubber flooring sheets conforming to ASTM F-1860-98 Standard Specification for Rubber Sheet Flooring and Backing.

B. Sheet Rubber Flooring: ASTM F 1859 Standard Specification for Rubber Sheet Flooring Without Backing.

1.6 RESILIENT BASE AND ACCESSORIES

A. Resilient Base: Rubber wall base 4 or 6 inch height, 0.125 inch thick, complying with ASTM F 1861, Type TS or TP, Group I or II.

B. Resilient Stair Treads, Risers, and Skirtings: Rubber accessories, complying with ASTM F 2169, Type TS or TP, Group II tread with contrasting color for visually impaired.

C. Integral-Flash-Cove-Base Accessories:
1. Cove Strip.
2. Cap Strip.

D. Resilient Molding Accessories.

1.7 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds.

B. Adhesives.

C. Stair-Tread-Nose Filler.

D. Metal Edge Strips.

E. Floor Polish
1. Acrylic as recommended by membrane manufacturer.
2. Clear topcoat (Aliphatic Polyurethane), non-immersible, high performance, zero VOC, coating.
3. Static Coefficient of Friction – not less than 0.5

1.8 EXAMINATION

A. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials whose presence would interfere with bonding of adhesive. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by tile manufacturer.
a. When concrete slabs are tested according to ASTM F 1869, Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride, 3 pounds of water/1000 sq.ft. of slab in a 24-hour period is generally accepted in the resilient floor covering industry as a safe maximum moisture emission level. Some manufacturer's installation instructions state that up to 5 pounds of water/1000 sq.ft. in 24 hours is acceptable for vinyl composition tile.
1) Alternative testing methods may be used when approved by flooring manufacturer.

2. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits of any kind.

1.9 Cleaning and Protection

A. Floor Polish:

1. Apply three to five coats with a minimum of 24 hours of drying time between each coat.

2. Coordinate type of polish with Owner's maintenance department.

<u>LEED SUGGESTIONS</u>

2.1 Floor coverings manufactured from post-consumer recycled rubber are available, and some vinyl composition floor tile products contain post-consumer recycled vinyl. For products advertised as having recycled content, contact manufacturers to determine the percentages of post-consumer and industrial waste used in manufacturing process.

2.2 When installing adhesives, manufacturers and installers must comply with VOC restrictions of authorities having jurisdiction. However, if the project is requiring a LEED credit for Low-Emitting Materials, the product should also meet the requirements of the California Department of Health Services Standard Practice for the Testing of Volatile Organic Emissions from From Various Sources Using Small-Scale Environmental Chambers, including 2004 Addenda.

<u>LESSONS LEARNED</u>

3.1 Although resilient floor coverings resist moisture, installations can fail if the bond between the floor tile or sheet floor covering and the substrate is weakened or destroyed by moisture on the surface seeping through the joints between units. Heat welding or chemically bonding the seams eliminates these joints. Generally, resilient sheet flooring manufacturers, installers, and end-users prefer the appearance and performance of heat-welded seams over chemically bonded seams. Some sheet manufacturers also offer alternative, proprietary seamless installation techniques. Although sheet products are usually specified for seamless installations, some large-size tiles can be heat welded or chemically bonded. If a seamless installation is required, verify availability and installation methods with manufacturers.

END OF SECTION

SECTION 096516

LINOLEUM FLOORING

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for linoleum sheet flooring.

1.2 SUBMITTALS

A. Maintenance Procedures: To seal linoleum, manufacturers generally recommend an initial application of floor polish. This floor polish is usually different from the products used with resilient products. To inform the Owner about linoleum's maintenance requirements the specifications need to include a requirement for submitting maintenance data and review maintenance procedures.

1.3 QUALITY ASSURANCE

A. Fire Test Performance: Unless otherwise indicated, provide flooring material to meet the following fire test performance criteria as tested by a recognized independent testing laboratory.
   1. ASTM E 648 (Critical Radiant Flux) of 0.45 watts per sq. cm. or greater, Class I.
   2. ASTM E 662 (Smoke Generation) Maximum Specific Optical Density of 450 or less.

B. ASTM F 2034 "Specification for Sheet Linoleum Floor Covering".

C. Provide adequate testing of concrete slabs, including relative humidity testing.

1.4 LINOLEUM SHEET FLOORING

A. Sheet linoleum flooring complying with ASTM F 2034.

B. Roll Size: Manufacturer's standard length by not less than 78 inches wide.

C. Thickness: 0.10 inch (2.5 mm), minimum.
   1. 0.08 (2.0 mm) is not acceptable.

D. Seams: Heat welded or cold bonded.

1.5 AUXILIARY MATERIALS

A. Heat Welding Bead.

B. Adhesive.

C. Trowelable Underlayments and Patching Compounds.

D. Floor Polish.

1.6 EXAMINATION

A. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:

1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials whose presence would interfere with bonding of adhesive. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by tile manufacturer.

a. When concrete slabs are tested according to ASTM F 1869, Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subflooring Using Anhydrous Calcium Chloride, 3 pounds of water/1000 sq.ft. of slab in a 24-hour period is generally accepted in the linoleum floor covering industry as a safe maximum moisture emission level.

LESSONS LEARNED

2.1 Manufacturers caution against using excessive amounts of liquid during maintenance procedures. Maintenance solutions that are abrasive or that measure more than 10 pH may damage linoleum.

2.2 Products generally have a factory-applied finish that provides temporary protection during installation. After installation, manufacturers typically recommend an initial application of two or three coats of liquid polish to seal the surface. Verify the recommendations of manufacturers for the products selected. Liquid floor polish is generally used for linoleum floor covering applications instead of paste wax.

END OF SECTION

SECTION 096566

RESILIENT ATHLETIC FLOORING

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for adhered sheet vinyl athletic flooring and athletic flooring with pad and accessories including game lines.

1.2 SHEET VINYL ATHLETIC FLOORING

A. Materials and Construction: ASTM F 1303, Type I (minimum binder content of 90 percent) requirements, Class C (foamed plastic) backing.

B. Applied Finish: Factory applied UV urethane.

C. Overall Thickness: 0.25 inch, minimum.

D. Seaming Method: Heat welded.

1.3 ACCESSORIES

A. Trowelable Leveling and Patching Compound.

B. Adhesives.

C. Heat Welding Bead.

D. Game Line and Marker Paint.

1.4 EXAMINATION

A. Concrete Substrates: Verify that concrete slabs comply with ASTM F 710 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, moisture, and pH tests recommended in writing by flooring manufacturer.
      a. Moisture Content of Slab: 3 pounds per 1,000 sq.ft. or less per RMA test method.

END OF SECTION

SECTION 096616

TERRAZZO FLOOR TILE

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for terrazzo tile, including setting materials, and polishing and finishing materials.

1.2 MATERIALS

A. Terrazzo Tile: Precast
1. Face Layer: Minimum depth of 3/8 inch and shall include 70% marble aggregate.
2. Chamfered face edges, where polished or square, where honed.
3. Surface to ground and polished or honed.

B. Mortar: ANSI A118.4

C. Grout: ANSI A118.6

1.3 INSTALLATION

A. TCA: F113

B. Finish: Grout, grind, and polish.

END OF SECTION

SECTION 096723

RESINOUS FLOORING

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Resinous flooring system with epoxy body coats. Applied as a self-leveling slurry with broadcast aggregates.

1.2 RESINOUS FLOORING

A. System Components
1. Body Coat(s)
a. Epoxy.
b. Formulation Description: 100 percent solids.
c. Application Method: Self leveling slurry with broadcast aggregates.
1) Thickness: 3/16 inch minimum.
d. Aggregates: Colored quartz (ceramic coated silica) or vinyl flakes.
2. Topcoat (Optional): UV-resistant sealing or finish coat(s).
a. Resin: Urethane.
b. Formulation Description: 100 percent solids.
c. Type: Clear.

B. Accessories
1. Primer.
2. Waterproof Membrane.
3. Reinforcing Membrane.
4. Patching and Fill Material.

C. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:
1. Compressive Strength (ASTM C579): 6,000 psi.
2. Tensile Strength (ASTM C307): 1,500 psi.
3. Water Absorption (ASTM C413): 1.0 percent maximum.
4. Coefficient of Thermal Expansion (ASTM C531): 0.00004 inch per inch times deg. F.
5. Abrasion Resistance (ASTM D4060): 0.023 gram loss.
6. Tensile Elongation Percent (ASTM D638): 2-4.

END OF SECTION

SECTION 096766

FLUID-APPLIED ATHLETIC FLOORING

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for fluid-applied athletic flooring with pad and accessories including game lines.

1.2 FLUID-APPLIED ATHLETIC FLOORING

A. Polyurethane Flooring over Resilient, Base Mat (PFR)
   1. Resilient, Base Mat: Manufacturer's standard base-mat underlayment of granulated rubber in polyurethane binder.
      a. Thickness: 5/32 inch, minimum
   2. Base-Mat Adhesive: Manufacturer's standard two-component polyurethane.
   3. Base-Mat Sealer: Manufacturer's standard two-component polyurethane compound formulated for sealing base mat.
   4. Elastomeric Resin: Two-component, solid, self-leveling, pigmented, zero-mercury polyurethane containing no rubber fillers.

1.3 ACCESSORIES

A. Trowelable Leveling and Patching Compound.

B. Adhesives.

C. Heat Welding Bead.

D. Game Line and Marker Paint.

1.4 EXAMINATION

A. Concrete Substrates: Verify that concrete slabs comply with ASTM F 710 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, moisture, and pH tests recommended in writing by flooring manufacturer.
      a. Moisture Content of Slab: 3 pounds per 1,000 sq.ft. or less per RMA test method.

END OF SECTION

SECTION 096813

TILE CARPETING

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for tile carpeting.

1.2 QUALITY ASSURANCE

A. Carpet shall meet or exceed Carpet and Rug Institute's (CRI) Appearance Retention Rating of 3.5 ARR.

B. Products comply with requirements of the CRI's "***Green Label Plus"*** Indoor Air Quality Testing Program.

1.3 PROJECT CONDITIONS

A. Concrete subfloors must meet the following requirements before carpet may be installed:
1. pH range of 5 to 9
2. Moisture-emission rate of 3 lb/1000 sq.ft. per 24 hours or less.

1.4 WARRANTY

A. Carpet Tile: 10 years (minimum).

(continued on next page)

1.5 MATERIALS

A. Carpet Tile

SCHOOL CARPET MINIMUM AVERAGE SPECIFICATIONS		
Carpet Property/Characteristic	**Minimum Specifications**	**Test Method**
Type Yard	Solution or Yarn Dyed	--
Color	Multi-Colored Products (select colors complimentary to soil type/color in region)	--
Surface/Style	Level Loop, Multi-Level Loop, Textured Loop, or Cut & Loop	--
Static	3.5kv (max – not to exceed)	AATCC-134 Step Method
Indoor Air Quality (IAQ)	CRI IAQ Certification "Green Label Plus"	CRI Test Program ASTM D-5116
In glue-down installation, include CRI IAQ Testing Program label for installation adhesives. Carpet over cushion, include CRI IAQ Testing Program label for carpet cushion.		
Flammability – Radiant Panel Test	Class I	ASTM E-648
NBS Smoke	<450 Flaming Mode	ASTM E-662
Tuft Bind (dry)	8 lbs, all products (16-20 lbs suggested for unitary backing)	ASTM D-1335
Delamination	Secondary backed products, 3.5 lbs	ASTM D-3936
Dimensional Stability	Removable modular products, 0.2% or less	ISO 2551
Colorfastness: light	4 or better (60 AFU 3 cycles)	AATCC 16-E
Colorfastness: ozone	4 or better after 2 cycles	AATCC 129
Colorfastness: crocking	4 or better (wet & dry)	AATCC 165
Colorfastness: water	4 or better, AATCC Transference Scale (only yarn dyed carpet) (grade change in color and staining)	AATCC 107
Soil Resistant Treatment	Minimum average of 350 ppm fluorine on pile fiber of 3 separate tests	CRI TM-102

1.6 INSTALLATION

A. Installation Method: Glue down with releasable adhesive or partial glue down with releasable adhesive.

LEED SUGGESTIONS

2.1 LEED credit for Indoor Environmental Quality (low-emitting materials) requires that carpet tile and installation adhesive meet or exceed the requirements for the Carpet and Rug Institute's (CRI) "Green Label Plus" program.

2.2 Compared with broadloom carpet, carpet tiles may have some unique advantages for environmental considerations. Expectations for a high-quality life-cycle for most carpet tiles and capabilities for spot or area replacement, flexibility, and access may be factors to consider. Carpet tiles can be spot glued effectively, reducing adhesive use without diminishing the quality of a commercial carpet tile installation. They are easier to transport, store, and handle compared to broadloom, which makes carpet tiles a more likely applicant for alternatives to land-fill disposal.

A. If carpet is being removed, contact carpet suppliers for carpet recycling programs.

END OF SECTION

SECTION 096816

SHEET CARPETING

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for carpet materials and accessories for a direct-glue down or preapplied adhesive installation of one of the following:.
   1. Tufted Broadloom

1.2 QUALITY ASSURANCE

A. Carpet shall meet or exceed Carpet and Rug Institute's (CRI) Appearance Retention Rating of 3.5 ARR.

B. Chemical Emission/Indoor Air Quality: All carpet specified must be in compliance with the Carpet and Rug Institute (CRI) "***Green Label Plus***" Indoor Air Quality Carpet Testing Program. The program label and registration number serve as evidence of compliance.

1.3 PROJECT CONDITIONS

A. Concrete subfloors must meet the following requirements before carpet may be installed:
   1. pH range of 5 to 9.
   2. Moisture-emission rate of 3 lb/1000 sq.ft. per 24 hours or less.

1.4 WARRANTY

A. Sheet Carpet: 10 years (minimum).

(continued on next page)

1.5 CARPET

A. Carpet, Tufted Broadloom

SCHOOL CARPET MINIMUM AVERAGE SPECIFICATIONS		
Carpet Property/Characteristic	**Minimum Specifications**	**Test Method**
Type Yard	Solution or Yarn Dyed	--
Color	Multi-Colored Products (select colors complimentary to soil type/color in region)	--
Surface/Style	Level Loop, Multi-Level Loop, Textured Loop, or Cut & Loop	--
Static	3.5kv (max – not to exceed)	AATCC-134 Step Method
Indoor Air Quality (IAQ)	CRI IAQ Certification "Green Label Plus"	CRI Test Program ASTM D-5116
In glue-down installation, include CRI IAQ Testing Program label for installation adhesives. Carpet over cushion, include CRI IAQ Testing Program label for carpet cushion.		
Flammability – Radiant Panel Test	Class I	ASTM E-648
NBS Smoke	<450 Flaming Mode	ASTM E-662
Tuft Bind (dry)	8 lbs, all products (16-20 lbs suggested for unitary backing)	ASTM D-1335
Delamination	Secondary backed products, 3.5 lbs	ASTM D-3936
Dimensional Stability	Removable modular products, 0.2% or less	ISO 2551
Colorfastness: light	4 or better (60 AFU 3 cycles)	AATCC 16-E
Colorfastness: ozone	4 or better after 2 cycles	AATCC 129
Colorfastness: crocking	4 or better (wet & dry)	AATCC 165
Colorfastness: water	4 or better, AATCC Transference Scale (only yarn dyed carpet) (grade change in color and staining)	AATCC 107
Soil Resistant Treatment	Minimum average of 350 ppm fluorine on pile fiber of 3 separate tests	CRI TM-102

1.6 AUXILIARY MATERIALS

A. Vinyl or rubber edge guard between carpet and sealed concrete.

B. Vinyl or rubber reducer strip between carpet and resilient flooring.

1.7 INSTALLATION

A. Comply with CRI 104, Section 9: "Direct Glue Down" or Pre-applied Adhesive Installation, Section 11.4 (Peel and Stick).

LEED SUGGESTIONS

2.1 LEED Credit for Indoor Environmental Air Quality (low-emitting materials) requires that carpet tile and installation adhesive meet or exceed the requirements for the Carpet and Rug Institute's (CRI) "Green Label Plus" Program.

END OF SECTION

SECTION 096900

ACCESS FLOORING

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES
A. Qualitative requirements for access flooring panels and understructure.

1.2 PERFORMANCE REQUIREMENTS
A. CISCA A/F, "Recommended Test Procedures for Access Floors"
1. Concentrated Loads: Provide floor panels, including those with cutouts, capable of withstanding a concentrated design load of 1000 lbf, with a top-surface deflection under load and a permanent set not to exceed, respectively, 0.080 inch and 0.010 inch according to CISCA A/F, Section I, "Concentrated Loads".
2. Ultimate Loads: Provide access flooring systems capable of withstanding a minimum ultimate concentrated load of 2500 lbf without failing, according to CISCA A/F, Section II, "Ultimate Loading".
3. CISCA A/F Wheel 2 Rolling Load: 500 lbf.
4. Pedestal Axial-Load Performance: Provide pedestal assemblies, without panels or other supports in place, capable of withstanding a 5000 lbf axial load per pedestal, according to CISCA A/F, Section V, "Pedestal Axial Load Test".

1.3 FLOOR PANELS AND UNDERSTRUCTURE
A. Floor Panels, General: Provide modular panels complying with the following requirements that one person, using a portable lifting device, can interchange with other field panels without disturbing adjacent panels or understructure.
1. Panel Attachment to Understructure: By gravity for main field areas bolted of pedestal may be necessary at perimeters and high-traffic areas.

B. Formed-Steel Panels
1. Solid.
2. Grates With or Without Dampers.
3. Perforated With or Without Dampers.

C. Pedestals: Assembly consisting of base, column with provisions for height adjustment, and head (cap); made of steel or aluminum or a combination of both.

D. Floor Panel Coverings
1. Solid Vinyl Tile: Static dissipative.
2. Carpet: Antistatic modular, adhesively bonded.

1.4 ACCESSORIES
A. Cutouts.
B. Service Outlets.
C. Diffusers.
D. Cavity Dividers.
E. Vertical Closures.
F. Ramps.
G. Railings.

END OF SECTION

SECTION 098000

ACOUSTIC TREATMENT

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for sound absorbing wall units and mounting accessories, and acoustical sound absorbing and diffusing units.

1.2 QUALITY ASSURANCE

A. Fire Test Response Characteristics
1. Flame Spread: 25 or less.
2. Smoke Developed: 450 or less.

1.3 MATERIALS

A. Core Materials: Glass-fiber board; mineral-fiber board; tackable, impact-resistant, high-density face layer; or impact-resistant, acoustically transparent, copolymer face-sheet layer for high-abuse applications.

B. Spline-Mounted Acoustical Wall Panels with Perforated Mineral-Fiber Board Core
1. Facing Material: Woven polyester, nonwoven polyester, polyolefin, or acoustically transparent vinyl fabric.
2. Nominal Panel Thickness: 3/4 inch minimum.
3. NRC: NRC 0.50 to NRC 0.90.

C. Spline-Mounted Acoustical Wall Panels with Glass-Fiber Board Core
1. Facing Material: Woven polyester, nonwoven polyester, polyolefin, or acoustically transparent vinyl fabric.
2. Nominal Panel Thickness: 3/4 inch minimum.
3. Noise Reduction Coefficient: NRC 0.20 minimum.

D. Back-Mounted Acoustical Wall Panels with Perforated Mineral-Fiber Board Core
1. Facing Material: Woven polyester, nonwoven polyester, polyolefin, or acoustically transparent vinyl fabric.
2. Nominal Core Thickness and System NRC: 1/2 inch and not less than NRC 0.35

E. Back-Mounted, Edge-Reinforced Acoustical Wall Panels with Glass-Fiber Board Core
1. Facing Material: Woven polyester, nonwoven polyester, polyolefin, or acoustically transparent vinyl fabric.
2. Nominal Core Thickness and System NRC: 3/4 inch and not less than NRC 0.65

F. Abuse-Resistant Acoustical Panels, General
1. Flame spread of panels shall be 25 or less under the ASTM E 84.
2. Panels are Class A.
3. Panels shall consist of wood fibers and a hydraulic cement binder formed under controlled conditions of heat and pressure.
4. Prime Painted Panels

G. Wall Sound Diffusers
1. Standard barrel shaped units with the following properties:
   a. WDS, Low Frequency Absorption: Glass fiber mat core laminated with 1.5 inches, 1.5 pcf sound absorbing glass matting; NRC 0.30 – 0.40.

H. Back-Mounting Devices: Adhesive, hook-and-loop tape, impaling chips, or metal "Z" clips.

1.4 ACOUSTICAL CEILING PANELS

A. Acoustical Baffles
1. Polyester, polyvinyl, or nylon fabric- wrapped panels, with core of 6 to 7 pcf fiberglass; seamless and bonded to panels

B. Ceiling-Mounted Diffusers
1. Manufacturer's standard asymmetric pyramidal units with properties as follows:
   a. CD – Standard: Glass fiber mat core laminated with fire retardant resin; NRC 0.12 – 0.17.
   b. CDA – Low Frequency Absorption: Glass fiber mat core laminated with 1.5 inches, 1.5 pcf sound absorbing glass matting; NRC 0.30-0.40.
   c. CDL – Sound Reflective: Glass fiber mat core lined with resin hardener; NRC 0.03 – 0.08.

C. Ceiling-Mounted Reflectors
1. Manufacturer's standard panels for ceiling suspension, designed to reflect sound energy, and with properties as follows:
   a. CR – Standard: Glass fiber mat core laminated with fire-retardant resin; NRC 0.15-0.25.
   b. CRA - Low Frequency Absorption: Glass fiber mat core laminated with 1.5 inches, 1.5 pcf sound absorbing glass matting; NRC 0.30-0.40.
   c. CRL – Sound Reflective: Glass fiber mat core lined with resin hardener; NRC 0.03 – 0.08.

<u>LEED SUGGESTIONS</u>

2.1 LEED for Schools includes a prerequisite for "Minimum Acoustical Performance". By using sound absorptive panels, both background noise and sound transmission can be decreased, thus assisting in compliance with the "Minimum Acoustical Performance".

END OF SECTION

SECTION 099100
PAINTING

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for exterior and interior painting with opaque finishes, including painted mechanical and electrical identification, primers, sealers, and finish paints.

1.2 SYSTEM DESCRIPTION

A. To establish a level of quality, the guide references the Master Painters Institutes (MPI) categories. The MPI categories listed are to assist in providing general guidelines for paint type selection. Use of MPI's "Approved Product List" is optional.

B. All materials used shall be lead and mercury free and VOC compliant with local authorities with jurisdiction.

1.3 EXTERIOR PAINTING SCHEDULE

A. Concrete, Stucco, and Masonry (Other Than Concrete Masonry Units) (Satin): (Latex System). Similar to MPI EXT 3.1A.

B. Concrete Masonry Units: (Latex System), similar to MPI EXT 4.2A.

C. Metal - Ferrous: (Latex System), similar to MPI EXT ***5.1M***.

D. Metal - Galvanized: (Latex System), similar to MPI EXT 5.3A.

E. Metal - Heat Resistant: (Maximum Temperature 1,000 degrees F.), similar to MPI ***#21***.

1.4 INTERIOR PAINTING SCHEDULE

A. Concrete Surfaces: (Latex), similar to MPI INT 3.1M.

B. Concrete Masonry Surfaces, similar to MPI INT 4.2E.

C. Metal - Ferrous: (***Latex*** System), similar to MPI INT ***5.1S.***

D. Metal - Ferrous: (***Dry-Fall*** System), similar to MPI INT ***5.1CC.***

E. Metal - Galvanized: (***Latex*** System), similar to MPI INT ***5.3N.***

F. Metal - Galvanized: (***Dry Fall*** System), similar to MPI INT ***5.3H.***

G. Wood - Painted: (***Latex*** System), similar to MPI INT ***6.3V.***

H. Gypsum Board: (***Latex*** System), similar to MPI INT 9.2M.

I. Plaster Surfaces: (***Latex*** System), similar to MPI INT 9.2M.

LEED SUGGESTIONS

2.1 As of July 7, 2008, the USGBC allows for Performance/Intent Equivalent Alternate Compliance Paths for obtaining Low-Emitting Materials Credit EQ 4. LEED for Schools Project Teams may substitute LEED for New Construction v2.2 EQc4 Low-Emitting Materials credits in place of corresponding LEED for Schools EQc4 Low-Emitting Materials credits. END OF SECTION

SECTION 099300

STAINING AND TRANSPARENT FINISHING

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for exterior and interior painting with transparent and semi-transparent finishes.

1.2 SYSTEM DESCRIPTION

A. To establish a level of quality, the guide references the Master Painters Institute's (MPI) categories. The MPI categories listed are to assist in providing general guidelines for paint type selection. Use of MPI's "Approved Product List" is optional.

1.3 EXTERIOR STAIN SCHEDULE

A. Wood trim, provide one of the following:
   1. Semi-transparent, oil or alkyd resin base stain, 2 coats, similar to MPI EXT 6.D.
   2. Solid color, oil or alkyd resin base wood stain, 2 coats, similar to MPI EXT 6.3C.

1.4 INTERIOR STAIN SCHEDULE

A. Wood Trim
   1. Polyurethane varnish finish: 2 finish coats of polyurethane varnish over clear sanding sealer and an optional oil stain, similar to MPI INT 6.1J.
      a. Provide wood filler on open grain wood before applying first varnish coat.

END OF SECTION

SECTION 099419

MULTICOLORED COATING SYSTEM

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for interior multi-colored coating system for high traffic areas.

1.2 QUALITY ASSURANCE

A. Fire-Performance Characteristics: Provide coatings with the following surface-burning characteristics as determined by testing identical products per ASTM E84 by UL or other testing and inspecting agencies acceptable to authorities having jurisdiction. Identify coatings with appropriate markings of applicable testing and inspecting agency.
   1. Flame Spread: 25 or less.
   2. Smoke Developed: 450 or less.

B. Owner Training: Applicator must provide adequate training of Owner's personnel in repair procedures, along with verification that proper equipment is available to Owner's personnel.

C. To establish a level of quality, the guide references the Master Painters Institutes (MPI) categories. The MPI categories listed are to assist in providing general guidelines for paint type selection. Use of MPI's "Approved Product List" is optional.

1.3 INTERIOR PAINTING SCHEDULE

A. Concrete, similar to MPI #112.
   1. Prime Coat: Latex primer sealer
   2. Finish Coat: Multi-color as recommended by manufacturer
   3. Surfaces: Concrete walls and ceiling

B. Concrete Masonry Surfaces, similar to MPI #112.
   1. Concrete masonry block filler
   2. Prime Coat: Latex primer sealer
   3. Finish Coat: Multicolored as recommended by manufacturer

END OF SECTION

SECTION 099600

HIGH PERFORMANCE COATINGS

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Surface preparation and application of high-performance coating systems.

1.2 QUALITY ASSURANCE

A. Quality Standards: "MPI Approved Products List" and "MPI Architectural Painting Specifications Manual."

1.3 MATERIALS

A. Undercoats
1. Block Fillers.
2. Interior Primers/Sealers.
3. Metal Primers.
4. Wood Stains.

B. Topcoats
1. Water-Based, Light-Industrial Coatings.
2. Epoxy Coatings.
3. Polyurethane Coatings.
4. Interior High-Performance Architectural Latex Coatings.

1.4 INTERIOR PAINTING SCHEDULE

A. Concrete Surfaces (Gloss): (Water Based Epoxy System), similar to MPI INT 4.1G.
1. Primer: Latex Wall Primer, 1.0 - 1.2 mils DFT/coat.
2. Finish Coats: Water Based Catalyzed Epoxy (Gloss) (55-75 units at 60 degrees F.), 2.5 - 3.0 mils DFT/coat.
3. Surfaces: Floors, stairs, striping on floors.

B. Gypsum Board (Semi-Gloss): (Water Based Epoxy System), similar to MPI INT 9.2F.
1. Primer: Vinyl Acrylic Latex, 1.1 mils DFT/coat.
2. Finish Coats: Water Based Catalyzed Epoxy, Semi-Gloss (20-30 units at 60 degrees F.), 2.5 - 3.0 mils DFT/coat.
3. Surfaces: Gypsum walls, ceiling, bulkheads, graphics.

END OF SECTION

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10 DIVISION SPECIALTIES

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SECTION 101100

VISUAL DISPLAY SURFACES

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for chalkboards, markerboards and visual aid boards, framing systems, and accessories.

1.2 CHALKBOARDS

A. Face Sheet: Minimum .021 inch thick porcelain enamel steel with matte finish.

B. Core: 3/8 inch thick particleboard.

C. Backing: .005 inch thick aluminum foil.

D. Trim: Factory applied anodized extruded aluminum.
1. Chalktray: Box type.
2. Map Rail: 1 inch display rail with cork insert and a map hook and clips for every 48 inches of map rail and fraction thereof.

1.3 MARKERBOARDS

A. Face Sheet: .021 inch thick liquid chalk writing surface, with low or high gloss finish.

B. Core: 3/8 inch thick particleboard.

C. Backing: .005 inch thick aluminum foil.

D. Trim: Anodized extruded aluminum with tray and 1 inch map rail with natural cork insert.

E. Trim: Factory applied anodized extruded aluminum.
1. Chalktray: Box type.
2. Map Rail: 1 inch display rail with cork insert and a map hook and clips for every 48 inches of map rail and fraction thereof.

1.4 TACK ASSEMBLIES

A. Material, provide one of the following:
1. Natural cork.
2. Plastic impregnated cork sheet.
3. Vinyl fabric faced industrial fiberboard.

B. Trim: Factory-applied anodized extruded aluminum.

1.5 PEGBOARDS

A. Material: Tempered hardboard with holes punched on one inch centers.

1.6 VISUAL DISPLAY RAILS

A. Cork, Vinyl-Fabric, or Polyester-Fabric Faced Visual Display Device.

1.7 SUPPORT SYSTEM (optional)

A. Support System for Visual Display Boards: Rail or modular supports.

1.8 SLIDING VISUAL DISPLAY UNITS

A. Horizontal-Sliding Units.

1.9 ACCESSORIES

A. Provide the following accessories for each individual chalkboard and markerboard unit:
1. 2 map rail ends.
2. 1 flag holder (one per room).
3. Special-purpose graphics.

END OF SECTION

SECTION 101200

DISPLAY CASES

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for an illuminated display case with its accessories.

1.2 QUALITY ASSURANCE

A. Composite wood products made without urea formaldehyde.

1.3 PRODUCTS

A. Bulletin Boards
- ***1. Cabinet: Aluminum or wood framed.***
- ***2. Glazed Doors: Sliding or hinged.***
- ***3. Illumination System: (optional).***
- ***4. Tack Surface: Natural cork, plastic-impregnated-cork, vinyl-fabric-faced, or polyester-fabric-faced tackboard assembly.***
- ***5. Mounting: Surface mounted or recessed.***

B. Display Cases
- ***1. Recessed Cabinets: Extruded aluminum or hardwood-veneer-plywood box.***
  - ***a. Cabinet Frame and Trim: Aluminum or hardwood species.***
- ***2. Surface-Mounted Cabinets: Extruded-aluminum or hardwood-veneer-plywood box.***
  - ***a. Cabinet Frame and Trim: Aluminum or hardwood species.***
- ***3. Glazed Doors: Sliding or hinged.***
- ***4. Adjustable Tempered-Glass Shelves.***
- ***5. Tack Surface: Natural cork, plastic-impregnated-cork, vinyl-fabric-faced, or polyester-fabric-faced tack assembly.***
- ***6. Illumination System: (optional).***

END OF SECTION

SECTION 101400

SIGNAGE

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for directional items, letters, signage, and plaques used in establishing identity, communication, or way finding.

1.2 QUALITY ASSURANCE

A. Comply with signage requirements indicated in the Americans with Disabilities Act.

1.3 PANEL SIGNS

A. Type: Unframed.

B. Material: ***Zinc, laminated polycarbonate-faced sheet; acrylic sheet; high pressure decorative laminate, photopolymer sheet; laminated, engraved sheet; laminated, etched photopolymer sheet with raised graphics and Braille; or laminated, sandblasted polymer sheet with raised graphics and Braille.***

C. Copy: Raised text, Braille and pictograms.

1.4 PLAQUES

A. Plaques.
1. Metal: Bronze.
2. Border Style: Plain bevel.
3. Background Texture: Manufacturer's standard pebble texture.
4. Background Finish: Provide dark statuary finish to comply with the requirement specified for bronze finishes, except provide background texture specified above in lieu of mechanical finish indicated.

1.5 DIMENSIONAL CHARACTERS

A. Cast Characters.
B. Aluminum Extrusions.
C. Fabricated Channel Characters.
D. Molded Plastic Characters.
E. Cutout Characters.

1.6 INSTALLATION

A. Wall-Mounted Signs: Mechanical fasteners.
1. Mounted on glass with matching opaque plate on opposite side of glass.

B. Dimensional Characters: Flush or projected mount.

C. Cast-Metal Plaques: Concealed or face mounting.

DEDICATION PLAQUE

1

John Smith Elementary School

Lincoln Logs Local School District

(Date)

(Name), Board President

2

(Name), Board Member
(Name), Board Member

(Name), Board Member
(Name), Board Member

(Name), Superintendent
(Firm Name), Architect

(Name), Treasurer
(Firm Name), Construction Manager

(Other Contractors)

Funded through a partnership with the

3

OHIO SCHOOL FACILITIES COMMISSION

Ted Strickland, Governor

Michael C. Shoemaker, Executive Director

Elements

Group 1: Name of School, Name of District, and OSFC Seal. **Use of the Seal is mandatory. A copy is available from the OSFC.**

Group 2: Date of Dedication, District Officials (including Board Members and Administrators), Architectural firm, and Construction Management firm. Contractors may be included as the Board of Education deems appropriate.

Group 3: State of Ohio participation. Wording should be consistent with above. Placement of Group 3 may be above Group 2 at option of the District.

END OF SECTION

SECTION 101426

POST AND PANEL / PYLON SIGNAGE

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for non-illuminated post and panel signs.

1.2 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with applicable provisions in ADA-ABA Accessibility Guidelines and ICC A117.1.

1.3 WARRANTY

A. Materials and Workmanship: 5 years.

1.4 PRODUCTS

A. Panel Signs
1. Message Panel Sign Materials: Aluminum sheet or composite aluminum-faced sheet.
a. Edge Condition: Square cut or bullnose.
b. Corner Condition: Square or rounded to radius indicated.
2. Panel Sign Frames: Extruded aluminum mitered with concealed anchors and welded.
a. Profile: Square or rounded.
b. Corner Condition: Square or rounded to radius indicated.
c. Frame Type: Mounted on posts.
3. Hollow-Box-Type Panel Signs
a. Message Panel Material: Aluminum sheet or composite aluminum-faced panel.
b. Corner Condition: Square or rounded to radius indicated.

B. Posts
1. Aluminum: Square, rectangular, semicircular, or rounded-end.

END OF SECTION

SECTION 101453

TRAFFIC SIGNAGE

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for traffic signs.

1.2 QUALITY ASSURANCE

A. Comply with US Manual on Uniform Traffic Control Devices for signs within public rights-of-way.

1.3 POST-MOUNTED SIGNS

A. Exterior "Accessible Parking" Signs
   1. 12 by 18 inch, 18 gauge steel with 1 inch radius corners. Bolt through top and bottom of sign face into 2 by 2 inch square steel post by 11 foot long (3.65 pounds/feet) with vandal-resistant fasteners.
   2. Finish: Baked enamel finish. Color of sign face is to be blue with white graphics. Color of post is to be selected by the Design Professional.

B. Stop and other traffic regulatory signs.

C. Visitor parking signs.

D. Breakaway post supports for signs within the rights-of-way.

END OF SECTION

SECTION 102113

TOILET COMPARTMENTS

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for compartments and cubicles appropriate for toilet rooms, including hardware and accessories.

1.2 QUALITY ASSURANCE

A. Flame-Spread Index: 75 or less.

1.3 COMPONENTS

A. Phenolic-Panel Core: Dark color or through-color matching face sheet.

B. Solid-Polymer Units: Either high-density polyethylene (HDPE) or polypropylene (PP) panel material.

C. Solid Color Reinforced Composite.

D. Brackets (fittings)
- ***1. Stirrup Type: Stainless steel.***
- ***2. Full-Height (continuous) Type: Stainless steel or polymer.***

E. Hardware and Accessories: Clear-anodized aluminum or stainless steel.
- ***1. Fasteners: Stainless steel.***
- ***2. Shoes: Stainless steel or polymer.***
- ***3. Hinges: Self-closing.***
- ***4. Latch and Keeper: Emergency access and accessibility requirements.***

1.4 INSTALLATION

A. General: Install panels with either three stirrup brackets or continuous type.

B. Install with vandal-resistant fasteners.

END OF SECTION

SECTION 102123

CUBICLES

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for medical treatment curtains, tracks, and other hardware.

1.2 MATERIALS

A. Curtains
1. Curtain Fabric: 100 percent polyester, flame-resistant.
2. Mesh Top: No. 50.
3. Curtain Drop: Beaded chain.

B. Curtain Tracks: ***Surface-mounted, aluminum box channel type.***

C. Curtain Carriers: One piece nylon, breakaway.

END OF SECTION

SECTION 102213

WIRE MESH PARTITIONS

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for fixed partitions used as enclosures, dividers, partitions, ***storage lockers, and equipment barriers*** fabricated of wire mesh.

1.2 STANDARD-DUTY WIRE MESH PARTITIONS

A. Wire Mesh: 0.135 steel woven wire, 1-1/2 inch diamond mesh or 1 by 2 inch rectangular.
   1. Doors: Swinging, swinging dutch, or sliding.
   2. Service Windows.
   3. Accessories
      a. Sheet Metal Base.
      b. Adjustable Filler Panels.
      c. Wall Clips.
   4. Finishes: Shop primed, baked enamel, or powder coated.

B. Framing: Cold rolled “C” section channels and angles.

END OF SECTION

SECTION 102226

OPERABLE PARTITIONS

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for track supported, operable panels and partitions, top hung and floor supported, manually operated.

1.2 SYSTEM DESCRIPTION

A. Sound Transmission Class: 50 minimum ***or as determined for compliance with LEED for Schools, Indoor Environmental Air Quality, "Minimum Acoustical Performance", prerequisite 3.***

B. Flame-Spread Index: 25 or less.

1.3 OPERABLE ACOUSTICAL PANELS

A. Panel Types
- ***1. Manually operated, individual or paired acoustical panel partitions.***
- ***2. Electrically operated, continuously hinged acoustical panel partitions.***
- ***3. Manually operated, individual or paired glass panel partitions.***

B. Operation: Manual, ***unless otherwise noted.***

C. Frame: Steel or aluminum.

D. Face/Liner Sheets: ***Steel or*** steel with gypsum board.

E. Finish Facing: Vinyl coated fabric wall covering, ***carpet wall covering, fabric wall covering, or paint.***

F. Accessories
- 1. Panel mounted chalkboards or markerboards.
- 2. Minimum 3/16 inch thick tackable cork surface beneath finish material.
- ***3. Pass doors.***
- ***4. Windows.***

END OF SECTION

SECTION 102813

TOILET ACCESSORIES

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for grab bars, towel dispensers, soap dispensers, toilet paper dispensers, shower accessories, metal framed mirrors, mop holder with shelf, shower curtain and rod, towel hooks, napkin disposals and vendors, hand dryers, and other accessories.

B. Accessories mounted on or recessed in walls and toilet compartments.

1.2 MATERIALS

A. Stainless Steel: ***AISI Type 304.***

B. Sheet Steel: ***ASTM A 1008.***

C. Galvanized – Steel Sheet: ASTM A 653, G60.

D. Galvanized Steel Mounting Devices: ASTM A 153.

E. Chrome Plating: ASTM B 456.

F. Mirrors: ASTM C 1503.

G. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

1.3 COMPONENTS

A. Grab Bars: Stainless Steel.

B. Towel Dispensers: Folded or roll towels.

C. Combination Towel Dispenser / Waste Receptacle: Roll or folded towels.

D. Folding Shower Seat

E. Soap Dispenser

F. Toilet Paper Dispenser: Roll or combination, roll.

G. Mirror

1. Stainless Steel Framed Mirror: Mirror shall have a one piece, ***stainless steel angle frame.***

H. Mop and Broom Holders

I. Shower Rods
   1. Shower curtains: Vinyl.

J. Towel Hooks

K. Sanitary Napkin Disposals and Vendors

L. Diaper Changing Stations

M. Child-Protective Seat

N. Hand Dryers
   1. Regulations: NFPA 70, UL, and ADA compliant.
   2. Operation: Touch button or electronic sensor activated with timed power cut-off switch.
   3. Cover Material and Finish: Cast-iron or steel with enamel finish; or stainless steel, no. 4 finish.

1.4 INSTALLATION

A. Install accessories with vandal-resistant fasteners.

END OF SECTION

SECTION 104400

FIRE PROTECTION SPECIALTIES

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for fire fighting devices and storage cabinets, except items or devices connected to a fire protection system.

1.2 QUALITY ASSURANCE

A. Integrity of fire rated walls must be maintained with installation of recessed or semi-recessed fire extinguisher cabinet.

B. Fire Extinguishers: NFPA 10.

1.3 FIRE EXTINGUISHERS

A. Type
1. Class K fires, potassium acetate kitchen.
2. Multipurpose dry chemical type in all other locations.

B. Public Area Mounting: Cabinet mounted.

C. Service Area Mounting: Metal brackets.

1.4 CABINETS

A. Cabinet Material: Steel

B. Door Style
1. Vertical duo panel with frame, unless otherwise indicated.
a. Door Glazing: Tempered glass.
1) Acrylic bubbles are not acceptable.
2. Solid panel at gymnasium.

C. Accessories
1. Door locks (optional).
2. Alarm (optional).

END OF SECTION

SECTION 105113

LOCKERS

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for storage facilities providing temporary security of contents; related hardware and locking devices; athletic and school lockers.

1.2 METAL LOCKERS

A. Type: Corridor (wardrobe) lockers, sheet steel, 0.0209 inch thick back and sides, 0.0528 inch thick doors and frame.
   1. Provide knock-down (mechanically assembled) standard locker construction.
   2. ***Material: Cold-rolled or metallic-coated steel sheet.***
   3. Door Style: Louvered vents at top and bottom, security vents, perforated vents, or concealed vents.
   4. Hinges: Knuckles or continuous.
   5. Locks.
   6. Recessed Latching: Provide either three-point latching or single point spring actuated latch. Single point gravity is not acceptable.

B. Type: Athletic lockers, all welded.
   1. Body
      a. Tops and Bottoms: 0.0528 inch unperforated, cold-rolled steel sheet.
      b. Backs
         1) 0.0428 inch solid
         2) 0.0528 inch perforated (exposed)
         3) 0.0897 inch expanded (exposed)
      c. Sides
         1) 0.0528 inch solid
         2) 0.0528 inch perforated
         3) 0.0897 inch expanded
   2. Doors
      a. 0.0677 perforated
      b. 0.0897 expanded
   3. Recessed Latching: Provide either three-point latching or single point spring actuated latch. Single point gravity is not acceptable.
      a. Provide strike and eye for padlock.

C. Tops: Sloped.

D. Number Plates: Aluminum plates with minimum 3/8 inch high etched, embossed or stamped numbers.

E. Locker Benches

LESSONS LEARNED

2.1 Storage provisions of the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities" (hereafter, ADA-ABA Accessibility Guidelines) and ICC/ANSI A117.1, "Accessible and Usable Buildings and Facilities", apply to metal lockers.

2.2 Special lockers that comply with accessibility requirements are available from most locker manufacturers. Considerations in selecting accessible metal lockers include hardware requirements and locations of shelves, hooks, and coat rods. Also, the locker layout must be designed to accommodate requirements for clear floor space.

A. According to ADA-ABA Accessibility Guidelines, "Where lockers are provided, at least 5 percent, but no fewer than one of each type, shall comply" with accessibility requirements for clear floor space, reach ranges, and operable parts. Requirements are as follows:

1. Clear Floor Space: A minimum clear floor space of 30 by 48 inches must be provided in front of each accessible locker. The long dimension may be either parallel or perpendicular to the locker. Clear space must be free of obstructions such as benches and overlapping door swings.

2. Reach Ranges: For an unobstructed approach, the maximum forward and side reach is 48 inches above the floor. Shelves and equipment may not be mounted higher than the maximum reach permitted. The lowest shelf must be at least 15 inches above the floor. Mounting heights of interior equipment, such as coat hooks and coat rods, are determined by dimensions of metal lockers and locations of the equipment within them, but all mounting heights must be within reach ranges.

3. Operable Parts: Parts such as latches and locks must be placed within the reach ranges indicated above. Also, "Operable parts shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. The force required to activate operable parts shall be 5 pounds maximum."

B. Special latches, keys, card-controlled electronic locks, and other accommodations complying with this requirement are available from locker manufacturers and are required, if locks are to be used.

END OF SECTION

SECTION 105613

METAL STORAGE SHELVING

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for open manufactured shelving for general storage.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance for Four-Post Metal Storage Shelving: MH 28.1.

B. Structural Performance for Post-and Beam Metal Storage Shelving: MH 28.2.

1.3 PRODUCTS

A. Four-Post Metal Storage Shelving: Metal storage shelving system with shelves that span between and are supported by corner posts.

1. Open or Closed Type

a. Load-Carrying Capacity per Shelf: 350 lb (minimum).

b. Posts: Steel.

c. Bracing: Single or double diagonal cross bracing at back and ends.

d. Shelves: Metallic-coated steel sheet or metallic-coated steel wire.

e. Base: Open, with exposed post legs or closed, with base strips fabricated from same material and with same finish as shelving.

f. Accessories: Finished end panels, shelf dividers, bins, and shelf-label holders.

g. Finish: Baked enamel or powder coat.

B. Post-and-Beam Metal Storage Shelving

1. Load-Carrying Capacity per Shelf: 400 lb (minimum).

2. Posts: Steel.

3. Shelves: Particleboard, steel sheet, metallic-coated steel sheet, or ribbed-metal decking.

4. Accessories: Tie plates, supports back-to-wall and back-to-back, letter-/legal-size record boxes, letter-size record boxes, and record box support rails.

5. Finish: Baked enamel or powder coat.

END OF SECTION

SECTION 105626

MOBILE STORAGE SHELVING

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for mechanically-assisted, carriage-mounted, high-density mobile storage units, support rails, fabrication, and installation including leveling of support rails.

1.2 SYSTEM DESCRIPTION

A. Carriage System Design and Features: The carriage system consists of a formed structural steel frame with hardened steel wheel riding on steel rails recessed-mounted to the floor. Rails shall be types selected by the manufacturer to ensure smooth operation and self-centering of mobile storage units during travel without end play or binding. Rail types, quantities, and spacing shall be selected by the manufacturer to suit installation conditions and requirements. All bearings used in the drive mechanism shall be permanently shielded and lubricated.

1.3 QUALITY ASSURANCE

A. Ease of Movement: Provide mechanically-assisted units capable of being moved by exerting a maximum horizontal force of 5 pounds on the operating wheel.

1.4 COMPONENTS

A. Rails:
1. Material: ASTM/AISI Type 1035 or 1045 steel, manufacturer's selection.
2. Capacity: 1,000 pounds per lineal foot of carriage, minimum.
3. Minimum Contact Surface: 5/8 inch wide, minimum.
4. Provide rail sections in minimum 6-foot lengths.
5. Rail configuration shall permit attachment to top of structural floor system with provision for leveling rails to compensate for variations in floor surface level.
6. Provide rail connections designed to provide horizontal and vertical continuity between rail sections, to gradually transfer the concentrated wheel point load to and from adjoining rail sections. Butt joints are not permitted.

B. Carriages:
1. Provide manufacturer's design movable carriages fabricated of welded or bolted steel construction. Galvanized structural components and/or riveted carriages are unacceptable.
2. Provide fixed carriages of same construction and height as the movable carriages, anchored to rails. Setting fixed shelving directly on floors is not permitted.
3. When required, provide bolted carriage splices designed to maintain proper unit alignment and weight load distribution.
4. Design carriages to allow the shelving uprights to recess and interlock into the carriages a minimum of 3/4 inch. Top-mounted carriages are unacceptable.
5. Provide each carriage with two wheels per rail.

C. Drive/Guide System:
   1. Design: Provide drive system which prevents carriage whipping, binding, and excessive wheel/rail wear under normal operation.
      a. If line shafts are used, all wheels on one side of carriage shall drive.
      b. If synchronized drives are used, a minimum of one wheel assembly driving both sides of carriage at center location is required. Drive shaft shall exhibit no play or looseness over the entire length of that assembly.
   2. Shafts: Solid steel rod or tube.
   3. Shaft Connections: Secured couplings.
   4. Bearing Surfaces: Provide rotating load bearing members with ball or roller bearings. Provide shafts with pillow block or flanged self-aligning type bearings.

D. Wheels:
   1. Materials: Type 1045 solid steel. Minimum load capacity per wheel: 3200 lbs.
   2. Size: Minimum 5 inches, outside diameter drive wheels.
   3. Guides: Determined by manufacturer; minimum 2 locations.

E. Face Panels:
   1. Materials: Plastic laminate clad particle board with plastic edging on vertical edges.
   2. Finishes: Selected from manufacturer's standard available colors and patterns.

F. Accessories:
   1. Waist High Carriage Locks: Provide manufacturer's standard.

END OF SECTION

SECTION 107500

FLAGPOLES

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for flagpoles.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide flagpole assemblies, including anchorages and supports, capable of withstanding the effects of wind loads, determined according to NAAMM FP 1001, "Guide Specifications for Design of Metal Flagpoles".
   1. Base flagpole design on polyester flags of maximum standard size suitable for use with flagpole or flag size indicated, whichever is more stringent.
   2. Basic Wind Speed: 90 mph; 3-second gust speed at 33 feet aboveground, unless otherwise noted as a greater wind speed.

1.3 PRODUCTS

A. Flagpoles
   1. Aluminum Flagpoles: Cone or Entasis tapered.

B. Mounting Type
   1. Foundation Tube.
   2. Vertical Wall Mount.
   3. Outrigger Wall Mount.

C. Fittings:
   1. Finial.
   2. Halyard
      a. Internal, winch system where pole is over 40 feet.
      b. External with locking cleat cover and halyard cover, where pole is under 40 feet.

END OF SECTION

11 EQUIPMENT DIVISION

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SECTION 111300

LOADING DOCK EQUIPMENT

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for equipment and material for the protection of service docks and for the loading and unloading of various types of service vehicles including:
1. Dock bumpers.
2. Dock levelers.
3. Dock lifts (scissors lifts).
4. Truck restraints.

1.2 QUALITY ASSURANCE

A. Dock Leveler Standard: MH 30.1.

B. Dock Lifts Standard: MH 29.1.

C. Truck Restraints: MH 30.3.

1.3 DOCK BUMPERS

A. Type: Molded rubber or laminated tread.

B. Mounting: Horizontal, vertical, or integral to leveler.

1.4 DOCK LEVELERS

A. Type: Mechanical or hydraulic, recessed in dock or edge of dock.

B. Rated Capacity: 25,000 pounds.

C. Function: Dock levelers shall compensate for differences in height between truck bed and loading platform.

D. Safety Device: Truck restraint designed to hold vehicle at load dock, if grade would allow vehicle to roll away.

1.5 DOCK LIFTS

A. Scissors-type hydraulic dock lift of capacity, size, and construction indicated; complete with controls, safety devices, and accessories required.
1. Mounting: Recessed.
2. Type: Stationary.
3. Lift Capacity: Not less than 5,000 pound axle load at ends and 5,000 pound axle load at sides.
4. Vertical Travel: Maximum of 60 inches from lowered height of 12 inches.

END OF SECTION

SECTION 113100

RESIDENTIAL EQUIPMENT

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for residential type equipment.

1.2 QUALITY ASSURANCE

A. Regulatory Requirements
1. NFPA 70
2. UL and NEMA
3. AGA and ANSI
4. NAEAC
5. ANSI A117.1

1.3 EQUIPMENT

A. Items funded by the OSFC:
1. Cooktop
2. Range
3. Oven
4. Microwave
5. Exhaust Hood
6. Refrigerator/Freezer
7. Dishwasher

END OF SECTION

SECTION 114000

FOOD SERVICE EQUIPMENT

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for equipment used for liquid and solid food storage, preparation, display, serving and cleanup in commercial kitchens.

B. Kitchen hood provided in Division 25.

1.2 QUALITY ASSURANCE

A. Codes and Standards
1. NSF Seal of Approval.
2. Underwriters' Laboratories Label.
3. NFPA 54, National Fuel Gas Code.
4. NFPA 70, National Electrical Code.
5. NFPA 96, Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment.
6. ASME Boiler Code.
7. Public Health Service Publication "Food Service Sanitation Manual".

1.3 FOOD SERVICE EQUIPMENT MATERIALS

A. Stainless Steel: AISI Type 302 or Type 304, No. 4 polished finish.
1. Unexposed finish shall be No. 2B.

B. Tops, Sinks, Dishtables and Drainboards: 14 gauge stainless steel.

C. Cabinet Bodies and Doors: 16 gauge stainless steel.

D. Drawers: 18 gauge stainless steel body with 16 gauge stainless steel front.

E. Shelves: 14 gauge stainless steel.

F. Cold Pans: 14 gauge stainless steel.

END OF SECTION

SECTION 115123

LIBRARY STACK SYSTEMS

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for library shelving and accessories.

1.2 QUALITY ASSURANCE

A. Quality Standard: Steel bracket shelving to comply with ANSI Z39.73.

1.3 LIBRARY SHELVING

A. Steel Bracket Units
1. Type: Single- or double-faced units.
2. Frame Style: Upright post, display, or wall hung.
3. Panels: End panels, countertops, canopy tops, and back panels.
a. Face: Wood veneer or high-pressure decorative laminate.

B. Steel Case Shelving
1. Panels: At top, back, and ends of units over steel panels.
a. Face: Wood veneer or high-pressure decorative laminate.

C. Wood Case Shelving
1. Type: Single- or double-faced units.
2. Panels: At top, back, and ends.

LEED SUGGESTIONS

2.1 LEED materials and resources credits, from the U.S. Green Building Council's (USGBC) LEED Rating System are usually awarded for construction of the base building prior to the installation of fixtures, furniture, and equipment (FFE). Because bookstacks are often considered FFE items, optional specification language for LEED credits has not been included in this Section.

2.2 If the designer does not wish to classify library shelves as FFE items, USGBC should be contacted for an interpretation on the specific project. In such cases, this Section may be altered by adding language similar to that found in the "LEED Submittals" Paragraph in Part I of the "Interior Architectural Woodwork" Section, and then by altering Part 2 "Wood Materials" Article in this Section's Text to require low-emitting materials. Other requirements can be added to suit the Project.

END OF SECTION

SECTION 115213

PROJECTION SCREENS

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for projection screens, their accessories, and necessary mounting and installation hardware.

1.2 FRONT PROJECTION SCREENS

A. Material and Viewing Surface of the Front Projection Screens: Provide screens manufactured from mildew and flame-resistant fabric of type indicated for each type of screen specified:
   1. Matte white viewing surface. Peak gain of 0.9 to 1.0, and gain of not less than 0.8 at an angle of 50 degrees from the axis of the screen surface.
   2. Material: Vinyl coated glass fiber fabric.
   3. Size of Viewing Surface
      a. At classrooms; 60 inches by 80 inches. (100 inches diagonal)

B. Manually Operated Screens: Fabricated for wall or ceiling installation and consisting of case, screen, and mounting accessories.

C. Electrically Operated Screens: UL labeled units consisting of case, screen, motor, controls, mounting accessories, and other components.

LESSONS LEARNED

2.1 Coordinate layout and installation of projection screens with adjacent construction, including ceiling frame, light fixtures, HVAC equipment, fire-suppression system, and partitions.

A. Coordinate with location of overhead projectors.

END OF SECTION

SECTION 115313

LABORATORY FUME HOODS

GENERAL GUIDELINES

1.1 SECTION INCLUDES
- A. Qualitative requirements for bench-top laboratory fume hoods, floor-mounted laboratory fume hoods, and piping and wiring within fume hoods.

1.2 PERFORMANCE REQUIREMENTS
- A. Containment: Tested according to ASHRAE 110.

1.3 QUALITY ASSURANCE
- A. Product Standard: SEFA.

1.4 PRODUCTS
- A. Fume Hoods
  1. Exterior: Steel with chemical-resistant finish or fiberglass.
  2. Interior Lining: Glass-fiber cement board, glass-fiber cement board with acid-resistant finish, steel sheet with epoxy coating, glass-fiber-reinforced polyester, epoxy, glass-fiber-reinforced epoxy, stainless steel, phenolic composite, or polypropylene.
- B. Accessories
  1. Airflow indicator.
  2. Airflow alarm.
  3. Sash alarm.

1.5 FIELD QUALITY CONTROL
- A. Hoods field tested according to “Flow Visualization and Velocity Procedure” requirements in ASHRAE 110.

1.6 FUME HOOD SCHEDULE
- A. Bench Top Fume Hood Type
  1. Ventilation Type: Constant volume, constant volume with variable-air-volume control, bypass, auxiliary-air bypass, or restricted bypass with variable-air-volume control.
  2. ASHRAE 110 As-Manufactured (AM) Rating: AM 0.05 maximum.
  3. ASHRAE 110 As-Installed (AI) Rating: AI 0.10 maximum.
  4. Work Top: Epoxy or phenolic composite.
  5. Cup Sinks: Epoxy, polypropylene, or stainless steel.
  6. Service Fittings.
- B. Floor-Mounted Fume Hood Type
  1. Ventilation Type: Constant volume, constant volume with variable-air-volume control, bypass, auxiliary-air bypass, or restricted bypass with variable-air-volume control.
  2. ASHRAE 110 As-Manufactured (AM) Rating: AM 0.05 maximum.
  3. ASHRAE 110 As-Installed (AI) Rating: AI 0.10 maximum.
  4. Floor: Epoxy or phenolic composite.
  5. Cup Sinks: Epoxy, polypropylene, or stainless steel.
  6. Service Fittings.

END OF SECTION

SECTION 116143

STAGE CURTAINS

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for stage curtains and tracks.

1.2 QUALITY ASSURANCE

A. Flame-Resistant Rating: NFPA 701.

1.3 MATERIALS

A. Curtain Fabrics

1. Main Curtain

a. 25 oz. per lineal yard woven cotton velour fabric; 54-inch minimum width.

2. Intermediate Curtain and Side Leg Drops

a. 20 oz. per lineal yard woven cotton velour fabric; 54-inch minimum width.

3. Rear Curtain

a. Muslin: Shear, plain woven fabric of 100 percent uncounted cotton weighing not less than 6 oz. per lineal yard; 100-inch minimum width.

B. Rigging

1. Curtain Battens: Steel pipe.

2. Trim and Support Cable: Steel air craft cable.

3. Trim and Support Chain: Grade 80 hardened alloy steel chain.

C. Curtain Tracks: With pulleys, blocks, carriers, and operating line.

1. Aluminum, straight or curved, for walk-along operation.

2. Steel, medium duty.

END OF SECTION

SECTION 116623

GYMNASIUM EQUIPMENT

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for equipment intended for use in athletic activities including:
1. Basketball backstops
2. Volleyball equipment
3. Gym dividers
4. Miscellaneous gymnasium equipment

1.2 QUALITY ASSURANCE

A. Standards: National Federation of State High School Associations ***(NFHS)***

B. Electrical Components, Devices, and Accessories: NFPA 70, Article 100.

1.3 BASKETBALL BACKSTOPS

A. Frame Assembly
1. Elementary School: Adjustable goal height.

B. Backboards: 3 feet 6 inches by 6 feet 0 inches
1. Tempered glass at main court and overhead supported units at side courts.
a. Provide fiberglass or wood backboards at wall-mounted side courts.

C. Goal: Front mount direct to frame assembly. Provide breakaway type rim.

D. Operation: Electric winch at overhead-supported folding backstops only.

E. Backstop Safety Lock: One on each overhead-supported backstop.

F. Backboard padding.

1.4 VOLLEYBALL EQUIPMENT

A. Volleyball Floor Plates and Sleeves
1. Floor Plate: Cast brass with flush hinged type.
2. Sleeve: Steel construction with concrete base flange and predrilled top flange to receive floor plate.

B. Volleyball Standards and Net
1. Extruded aluminum or extruded high strength steel standards.
a. Provide minimum of 10 height adjustments.
2. Net: Provide 4-inch square mesh fabricated from #24 nylon and vinyl-coated steel top cable.

C. ***Accessories (optional): Net tensioning system, bottom net lock tightener, judges' stands, safety pads, post standard transporter, wall storage rack, and storage cart.***

1.5 GYM DIVIDERS

A. Type: Fold up, roll up, or walk draw.

B. Curtain Material
1. Lower Section: 18 ounce solid vinyl polyester reinforced fabric, flame resistant.
2. Upper Section: Open polyester grid weave, coated with PVC, flame resistant.

C. Operation: Electric or manual.

D. Suspension System: Anchored to structural framing.

E. Accessories
1. Wall-mounted key switch control.

1.6 MISCELLANEOUS GYMNASIUM EQUIPMENT

A. ***Safety*** Padding
1. Flame***,*** puncture, and tear-resistant vinyl coated nylon fabric over foam filler adhered to plywood backing board.
2. Cover Material: 14 oz. minimum.
3. Flame-resistant rating: Passes NFPA 701.
4. Fabric cover to be treated with fungicide for mildew resistance.

B. Mat Hoist (optional)
1. Stationary overhead-supported mat hoist capable of hoisting one 45 by 45 foot mat.

C. Chinning Bar ***(optional)***
1. Bar shall be 1-1/16 inch diameter by 3 feet 6inches in length, supported by formed brace supports approximately 1 foot 5 inches from wall.

END OF SECTION

SECTION 116643

INTERIOR SCOREBOARDS

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for interior scoreboard and accessories.

1.2 MATERIALS

A. Unit to score volleyball, basketball, and wrestling.

B. Wall mounted unit.

C. Tenth of a second timing for last 50 seconds.

D. Control console for each board installed.

E. Carrying case.

F. Shot clocks at high schools.

1.3 INSTALLATION

A. Provide console control outlet in spectator bleachers.

END OF SECTION

SECTION 118226

WASTE COMPACTORS AND DESTRUCTORS

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for waste compactors, component fittings, and accessories.

1.2 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Waste Compactor Standards: Comply with ANSI Z245.2, "Equipment Technology and Operations for Wastes and Recyclable Materials—Stationary Compactors—Safety Requirements," and NFPA 82, "Incinerators and Waste and Linen Handling Systems and Equipment."

C. Waste Bin and Hopper Standard: Comply with ANSI Z245.30, "Refuse Collection, Processing, and Disposal Equipment—Waste Containers—Safety Requirements."

1.3 WASTE COMPACTORS

A. Self-Contained Horizontal (Liquid Wastes) Compactors: Manufacturer's standard packaged units with components, options, and accessories needed to comply with requirements and provide complete functional systems.
   1. Minimum WASTEC Rating/NSWMA Base Size: 1.00 cu.yd (0.765 cu.m).
   2. Controls
      a. Provide fully enclosed doghouse with side door, to be fed from ground.
      b. Key-controlled motor.

LEED SUGGESTIONS

2.1 LEED certification of a project requires documentation that all prerequisite requirements (prerequisites) have been met, plus a minimum number of Credit points. The U.S. Green Building Council's MR-Prerequisite 1, "Storage and Collection of Recyclables," requires "an easily accessible area that serves the entire building and is dedicated to the collection and storage of non-hazardous materials for recycling, including (at a minimum) paper, corrugated cardboard, glass, plastics, and metals." Most other LEED rating systems have a similar requirement. Waste compactors are generally an essential part of efficient collection and storage of waste for recycling.

A. Recycling significantly reduces the volume of waste to be transported and can improve sanitation where the waste originates. Presorting and separating waste materials as part of a recycling program requires temporary on-site storage of recyclable waste. Separating and compacting materials such as cardboard and other paper products reduces storage space necessary between collections.

END OF SECTION

SECTION 119200

ART ROOM EQUIPMENT - KILNS

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for kilns and accessories.

1.2 QUALITY ASSURANCE

A. UL / CSA Listed.

1.3 KILN FEATURES

A. Dimensions: Minimum 23.5-inch width and 27-inch depth.

B. Power Supply: Gas or 208V electric.

C. Temperature: 10 cone or 2350 degree Fahrenheit minimum.

D. Automatic Controller.

1.4 ACCESSORIES

A. Vent

B. 3-inch Brick

C. Furniture kit

END OF SECTION

12 DIVISION

FURNISHINGS

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124813 Entrance Floor Mats and Frames
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126600 Telescoping Stands
129100 Site Furnishings

SECTION 122113

HORIZONTAL LOUVER BLINDS

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for horizontal louver blinds with aluminum slats.

1.2 PRODUCTS

A. Horizontal Louver Blinds, Aluminum Slats
1. Coating: Reflective.
2. Maximum Light-Blocking Type.
3. Tilt Control: Manual with wand or manual with cord.
4. Lift Operation: Manual with cord.
5. Valance.

END OF SECTION

SECTION 122413

ROLLER WINDOW SHADES

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for roller window shades.

1.2 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Passes NFPA 701.

B. Motorized Operators: UL listed.

C. Comply with WCMA A 100.1.

1.3 PRODUCTS

A. Shade Band Material: PVC-coated fiberglass, PVC-coated polyester, PVC-coated fiberglass and polyester blends, or fiberglass and acrylic blend.

B. Rollers: Electrogalvanized or epoxy primed steel or extruded-aluminum tube.

C. Top: Fascia and end caps; fascia, end caps, and top/back cover; pocket-style headbox with bottom cover or pocket with ceiling slot opening.

D. Shade Type: Audiovisual light blocking or skylight.

E. Shade Operation: Manual with spring roller; manual with continuous-loop bead chain, clutch, and cord tensioner and bracket; manual with gear and crank; or motorized operator.

F. Valance.

LEED SUGGESTIONS

2.1 Shading coefficient (SC) and the more recently preferred solar heat gain coefficient (SHGC) are values derived from the solar-optical properties of the glass or other glazing, the in-between air space, and the fenestration covering assembly. The relationship of glazing, shading, and fenestration energy flow is well-documented in the 2001 ASHRAE HANDBOOK – Fundamentals, Ch. 30. Both coefficients measure how well a glazed opening blocks heat caused by sunlight; the lower the SC or SHGC, the less heat gained in the protected space. The optimum solar0optical property levels for lowering SC and SHGC and reducing heat gain are as follows:

A. Transmittance – Low
B. Absorptance – Low
C. Reflectance – High

2.2 Roller shades with metalized fabric backings can lower the solar heat gain through glazed openings by blocking transmission of and reflecting incoming solar radiation. Low absorptance of metalized fabrics minimizes heat gain caused by radiant heat. Metallized shades mounted in front of a single pane will reduce directly transmitted solar energy by at least 80%. Besides reflecting heat, metallized fabrics reflect light and control glare.

2.3 SC and SHGC values for light- or dark-colored roller shades vary significantly. Reducing heat gain through glazed openings from solar exposure is best accomplished with light-colored shades because light-colored surfaces reflect light more efficiently and absorb less heat than dark-colored surfaces. Solar-optical values for the shade material and color should be obtained from the manufacturer and considered when calculating HVAC cooling loads.

2.4 Fixed lites with tinted or coated glazing assemblies with low SC and SHGC ratings may not require shading devices. Internal shading devices can only affect solar radiation that has passed through the tinted or coated glass and can reduce only that portion of the heat gain than can be reflected back through the glass again. According to the 2001 ASHRAE HANDBOOK – Fundamentals, "the energy benefit of a shade decreases as the SC of the unshaded glass decreases, due to the low transmittances and the inability of the occupant to change this factor."

2.5 In cold climates, roller shades can be manipulated to admit heating solar radiation when opened or to help retain room heat when fully closed. Depending on the building orientation, site conditions, outside-air temperature, and glazing assembly characteristics, it is possible for solar heat gain to offset heat loss through glazed openings during heating operations.

2.6 Designed use of daylighting is an issue that is increasingly being considered by Design Professionals. Daylighting can be used in building design in lieu of or as a supplement to electric lighting, with consequent reduction in energy consumption. Given constantly changing and widely variable conditions, predicting daylight distribution and glare in actual buildings can be complex. Integrating the effects of daylighting with those of electric lighting so adequate illumination levels can be achieved and maintained may also be complicated. Computer programs are currently being developed to aid in the design and analysis of daylighting. Because blinds and shades can be easily and effectively used to manipulate daylighting, they may play an important role in practical lighting design decisions.

END OF SECTION

SECTION 123550

EDUCATIONAL CASEWORK

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for ***educational casework including open casework,*** modular casework, and music casework, manufactured with plastic laminate facing and countertops.

1.2 QUALITY ASSURANCE

A. Casework Grade: Provide plastic laminate faced casework complying with the referenced quality standard and the following grade:
   1. Grade: custom.

B. Design Requirements for ***Educational*** Casework
   1. Design system of cabinets which will be chip and abrasion-resistant under normal usage and will protect ***student clothing, materials, musical*** instruments and cases from damage under normal use.
   2. Design shelving to withstand continuous use without surface or front edge breakdown.
   3. Hanger rods ***or hooks*** to support a minimum vertical load of 200 pounds applied anywhere.
   4. Full-height door to support a minimum vertical load of 200 pounds applied at outer edge.

1.3 MATERIALS

A. Low-Emitting Materials: Adhesives and composite wood products shall not contain urea formaldehyde.

B. Plastic laminates, provide one of the following:
   1. High pressure decorative laminate complying with NEMA LD3, Grade GP-28.
   2. High pressure decorative laminate complying with NEMA LD3, Grade CL-20.
   3. High pressure decorative laminate complying with NEMA LD3, Grade BK-20.

C. Edge Banding for Plastic Laminate: Rigid PVC extrusions, through color with satin finish, 3mm thick at doors and drawer fronts, 1mm thick elsewhere.

D. Melamine Faced Particleboard: Medium density particleboard complying with ANSI A208.1, Grade M-2, with decorative surface of thermally fused, melamine impregnated web complying with ALA 1992.

E. Particleboard: ANSI A208.1, Grade M-2.

F. Hardboard: AHA A135.4, Class 1 tempered.

G. Plywood: Hardwood plywood of any species similar in color and grain to exposed wood. HPVA HP-1, Grade C faces and Grade J crossbands. Semi-exposed backs of plywood with exposed faces shall be the same species as faces.

H. Epoxy Tops and Sinks (Science Rooms): Factory molded of modified epoxy-resin formulation, uniform mixture throughout full thickness with smooth, nonspecular finish.

I. Hardware and Accessories
1. Batt Hinges: BHMA A 156.9.
   a. Frameless, concealed (European type) are not acceptable.
2. Pulls.
3. Door Catches.
4. Drawer Slides: BHMA A 156.9.
5. Drawer and Door Locks on all doors and drawers.
6. Adjustable Shelf Supports.
7. Grommets.
8. Tote Trays.
9. Articulating Keyboard Trays.
10. Glass: 1/4 inch laminated safety glass.
11. Coat Rods.
12. Mirrors.

PLASTIC LAMINATE CASEWORK CONSTRUCTION
(Dimensions are minimum)

	CORE	SURFACE	EDGE	CONSTRUCTION/ JOINERY	HARDWARE
Cabinet Boxes - Base and Wall					
*Exposed vertical surfaces	All front and Sides: 3/4" Particleboard Base bottom: 3/4" plywood Wall top and Bottom: 3/4" Particleboard Back: entrapped - 3/8" particleboard or 1/4" tempered hardboard	GP28	Finish all exposed edges (including wall cabinet top and bottom with 1mm (PVC)).	Doweled, glued under pressure	
*Semi-exposed parts (interior of open cabinets, not including drawer bodies)		CL20 or melamine			
*Concealed surfaces		CL20 or melamine			
*Panel ends		GP28			
Countertops (wet areas)	1" exterior grade veneer core plywood or phenolic resin particleboard	GP50 balanced with backing sheet	3mm PVC	Apply silicone sealant to joint between HPL top and backsplash. Field joints >48" apart and >48" from end of top.	

	CORE	SURFACE	EDGE	CONSTRUCTION/ JOINERY	HARDWARE
Countertops	1" particleboard 1" epoxy resin (science rooms)	GP50 balanced with backing sheet	GP50	Apply silicone sealant to joint between HPL top and backsplash. Field joints >48" apart and >48" from end of top.	
Cabinet Doors	3/4" particleboard	GP28 with CL20 liner on back.	3mm PVC		Heavy duty, 5 knuckle, 2-3/4" institutional type hinge (no concealed hinges).
Drawer Fronts	3/4" particleboard	GP28 with CL20 liner on back.	3mm PVC	Doweled, glued under pressure.	Wire design pulls.
Drawer Sides and Backs	1/2" particleboard or 5/8" medium density fiberboard	Melamine on all visible surfaces with drawer in normal open position.			Combination epoxy coated steel and nylon roller bearing drawer slides. Self-closing. Full extension for file drawers.
Drawer Bottoms	Fully captured Construction - Minimum thickness: 1/4". Platform construction - minimum thickness: 1/2".	Melamine panel product or particle-board.			Platform construction; must use wrap around drawer slide.
Shelves	1" particleboard	GP28	1mm PVC on front and back edges.	Multiple holes (minimum 5mm diameter at 1-1/4" O.C.).	

1.4 COMPONENTS

A. Open Casework for Coats: Open plastic laminate units with either coat rods or coat hooks and shelves or divided shelf space into smaller spaces (i.e. 12 inches ***wide*** by 72 inches ***high*** by ***12*** inches deep) for children's personal storage. Exact dimensions ***and design may*** vary depending on shape of room. ***Design should be "age appropriate". For example, lower grade classrooms could include 12 inches wide by 48 inches high by 12 inches deep "cubbies" with a 12" x 12" x 12" shelf above. A seat/shelf may be included as well. Design should be coordinated with District to meet student needs.***

B. Tall Wardrobe: Coat and personal belonging storage for staff. Cabinet should be 24 inches deep, 84 inches tall, and range from 18 to 24 inches wide. Some wardrobe units have a file drawer in bottom depending on staff needs.

C. Tall Storage: Cabinet with door in various depths and widths, and either 72 to 84 inches high. Interior configuration will vary from adjustable and fixed shelves to built-in files or tote tray bin storage depending on specific needs.

D. Mail Cubicles: Plastic laminate unit with either removable or fixed divider shelves for staff mail. Mail slots are usually about 12 to 14 inches deep, 10-1/2 to 12 inches wide, and 2 to 3 inches high.

E. Worksurface: Plastic laminate countertop with grommets and grommet holes for card access to electrical receptacles and computer ports below worksurface. Worksurface would be placed at required height for specific tasks with kneespace under it and structural supports to the floor. There would be no backsplash at a worksurface.

F. Bookcases: Plastic laminate open (no doors) 12-inch deep units in various widths and heights with adjustable shelves. Units would have a plastic laminate countertop on it.

G. Deep Tall Shelving: Plastic laminate open units (no doors) that are either 72 or 84 inches high and deeper than 12 inches. Widths will vary. Units should not be over 36 inches wide to avoid warping of shelves under weight of books.

H. Circulation Desk Casework: Plastic laminate unit (could have wood edges) designed specifically for the function of checking in and out books in a media center, reference assistance from staff to students, and work area for media center staff. Unit needs to be ADA accessible, and should include space for computers, file storage, minimal book storage, worksurface for writing, and space for the return of books. Size, shape, and specifics of this unit should be based on shape of room, size of media center, type of school, and school programs. Include grommet and grommet holes for cord access to computer ports and electrical receptacles.

I. Secretarial Workstation: Plastic laminate unit (could have wood edges) designed specifically for the function of secretarial/administrative duties. Unit needs to be ADA accessible, and should include space for computers, file storage, small personal supply storage, manual and form storage and worksurfaces for writing and telephone. 42 inches high, 10 to 12 inches deep transaction surfaces are often used. Size, shape, and specifics of this unit should be based on shape of room, size of school, and functions of staff. Include grommets and grommet holes for cord access to computer parts and electrical receptacles.

1.5 MUSIC CASEWORK

A. Cabinet Wall Panels: 3/4 inch thick industrial grade particleboard, minimum 45 pcf with thermoset polyester laminate complying with NEMA LD3-1991, GP 20 and ALA 1992 specifications standards.

B. Cabinet Shelving
1. Cabinets up to 27 inches wide: One piece high molecular blow molded polyethylene with 1-3/8 inch radius front edge or ABS surfacing thermo-formed with ribbed pattern and hair cell texture. Mount to cabinet walls with steel clip supports.
2. Robe/Uniform Storage Cabinets over 27 inches wide: Two piece high molecular blow molded polyethylene with 1-3/8 inch radius front edge or ABS surfacing thermo-formed with ribbed pattern and hair cell texture. Mount to cabinet walls with steel clip supports.
3. Instrument Storage Cabinets over 27 inches wide: Industrial (cabinet) grade particleboard, minimum 45 pcf, 3/4 inch thick with 1-1/2 inch thick front edge drop with 1-3/8 inch radius and postforming grade high pressure plastic laminate. Mount to cabinet walls with steel clip supports. Provide tubular steel support at front edge.

C. Edges: Laminate doors and leading edge of music instrument storage cabinet vertical and upper horizontal members shall have a high impact rigid PVC extrusion, 3mm in thickness. The 3mm thick edging shall be applied with hot melt adhesive, and shaped to provide radiused front edges.

D. Grille doors shall be constructed of electronically welded, .314-inch diameter heavy gauge steel perimeter and crossbrace wire, and .194-inch diameter vertical stringer wire. Five knuckle hinge and lock hasp shall be formed and welded to door frame and cross members. Lock hasp provides space for name/number plate.

E. Finish Hardware
1. Hinges, compartment doors: Two case hardened spring steel barrel hinges with .094-inch thick leaves and .25-inch diameter nonremovable pins. Through bolt to cabinet wall.
2. Hinges, full-height cabinet doors: Continuous steel hinges.
3. Locking slide bolt designed for padlocks, with strike plate; 14 gauge steel; provide clear plastic label holder for identification card insert.
4. Cabinet levelers: Four leveling glides within minimum 3/8-inch diameter threaded rod in steel corner brackets.

LEED SUGGESTIONS

2.1 The U.S. Green Building Council's - Green Building Rating System require that a minimum of 50% of wood-based materials be certified as having been obtained from forests that comply with FSC STD-01-001, FSC Principles and Criteria for Forest Stewardship, for a building to qualify for Credit MR 7. Because the percentage of certified wood-based materials is determined from the costs of the various wood-based materials, casework can have a significant effect on meeting the 50% requirement. The Certified Forest Products Council lists on its website a number of cabinet manufacturers who produce cabinets made from certified wood.

2.2 LEED Credit EQ 4.4 (low-emitting materials) that require composite wood products be made without using urea-formaldehyde binders or adhesives. Urea-formaldehyde binders are commonly used in particleboard and MDF, and urea-formaldehyde adhesive is used in hardwood plywood. Softwood plywood and hardboard do not used urea formaldehyde. Particleboard made with a phenol-formaldehyde binder, which emits far less formaldehyde than urea formaldehyde and which qualifies as an "exterior glue," is available. MDF made without urea formaldehyde is also available.

END OF SECTION

SECTION 123553

LABORATORY CASEWORK

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for plastic-laminate laboratory casework, including countertops, sinks, and service fittings.

1.2 QUALITY ASSURANCE

A. Construction shall equal or exceed that of “Educational Casework”.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Flammable Liquid Storage Cabinets: NFPA 30.

1.3 MATERIALS

A. Materials:
1. Particleboard: ANSI A 208.1, Grade M-2, made with binder containing no urea formaldehyde or straw-based particleboard complying with ANSI A 208.1, Grade M2, except for density, made with binder containing no urea formaldehyde.
2. Plastic Laminate: High pressure decorative laminate complying with NEMA LD3.
   a. Thermostet panels may be used for semi-exposed surfaces, only.
3. Edgebanding for Plastic Laminate: Rigid PVC extrusions, through color with satin finish, 3mm thick at doors and drawer fronts, 1mm thick elsewhere.
4. Acid Storage Lining: 1/4 inch thick polypropylene, epoxy, or phenolic composite lining material.

B. Countertops
1. Materials: Epoxy resin ***or phenolic composite***, 1 inch thick minimum.

C. Sinks
1. Material: Cast epoxy resin.

D. Service Fixtures
1. Piped Service: Air, gas, vacuum, steam, hot water, cold water, and distilled water.
   a. Comply with SEFA 7, “Laboratory and Hospital Fixtures – Recommended Practices.”
      1) Comply with “Vandal-Resistant Faucets and Fixtures” recommendations in SEFA 7.
2. Power Receptacles: Comply with NEMA WD 1, NEMA WD6, and UL498. Duplex type, configuration 5 20R.
   a. Receptacle Grade: Hospital.

1.4 HARDWARE

A. Locks: Cam type, complying with BHMA A156.H, Type E07281.

B. Hinges: Stainless-steel or epoxy-coated steel 5 knuckle, complying with BHMA 156.9, Grade 1, with antifriction bearings and rounded tips.
   1. Frameless concealed hinges, Type BD1602, are not acceptable.

C. Pulls: Bent metal wire of stainless steel.

D. Drawer Slides: Steel, self-closing; complying with BHMA A156.9, Type B05091.
   1. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Full over travel extension, ball-bearing type.

E. Adjustable Shelving Supports: Powder-coated steel shelf rests complying with BHMA A156.9, Type B04013.

F. Catches: Roller type or magnetic type.

1.5 ACCESSORIES (optional)

A. Reagent Shelves.

B. Burette Rods.

C. Upright Rod Assembly and Metal Crossbar.

D. Lattice Assembly.

E. Pegboards.

END OF SECTION

SECTION 124813

ENTRANCE FLOOR MATS AND FRAMES

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for special floor surfaces at entrances including roll-up linked tread type floor mat can be either recessed or surface mounted, or entrance tiles. Are not intended to be mounted over a drainage pit.

B. There shall be a five-step or fifteen foot walk off mat at all entry points into the building. If the area cannot accommodate a fifteen foot mat, the mat should be as long as the area will accommodate.

1.2 ROLL-UP MATS

A. Recessed Mat Frames
1. Extruded Aluminum: ASTM B 221, alloy 6063-T5.

B. Roll-Up Vinyl or Aluminum Linked Tread Floor Mat.
1. Tread Surface: Level-cut, nylon pile carpet.

1.3 ENTRANCE TILES

A. Carpet-Type Tiles.

LEED SUGGESTIONS

2.1 Dust and dirt can be carried into buildings on people's footwear, contributing to Indoor Air Quality (IAQ) problems and reducing the durability of interior floor finishes. Comprehensive walk-off systems specifically engineered for this purpose can offer a cost effective solution.

END OF SECTION

SECTION 124816

ENTRANCE FLOOR GRILLES

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for recessed foot grilles and frames.

1.2 COMPONENTS

A. Aluminum Foot Grilles
1. Top Surface: Serrated aluminum or carpet insert.

B. Frame: Same material and finish as foot grille.

END OF SECTION

SECTION 126600

TELESCOPING STANDS

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for telescoping bleachers.

1.2 DESIGN REQUIREMENTS

A. Comply with ADA Rules and Regulations, and ICC/ANSI 300-2002 Bleachers, Folding and Telescopic Seating, and Grandstands.

1.3 COMPONENTS

A. Bench seats; wood or contour plastic seating
   1. Wood Bench Bleachers
      a. Depth: 10 inches
   2. Molded Plastic Bleachers
      a. Profile: Contoured seat surface
      b. Depth: 10 inches (12 inches, option with 24 minimum row spacing)

B. Operation, provide one of the following:
   1. Manual (limit 12 rows).
   2. Automatic friction or nonfriction type integral power unit.

C. Wheelchair-Accessible Seating: Seating cutouts or retractable truncated benches. ***Refer to ADAAG 4.33.3.***

D. Deck: Plywood.

E. Safety Rails.

F. Accessories: Steps, stairs, ramps, closure panels, signage, and scorer's table.

END OF SECTION

SECTION 129100

SITE FURNISHINGS

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for site furniture and fixtures.

1.2 PRODUCTS

A. Trash Receptacles: Precast concrete or metal to act as a holder for can or bag.

B. Seating: Precast concrete or metal.

C. Bicycle Racks: Steel pipe or tubing.

END OF SECTION

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SPECIAL CONSTRUCTION

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DIVISION 13: SPECIAL CONSTRUCTION

134814 Sound Barriers

SECTION 134814

SOUND BARRIERS

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for sound barriers.

1.2 SYSTEM DESCRIPTION

A. Acoustical Performance: Sound absorbing panels shall have a mineral rock wool sound-absorbing batt between the perforated face and solid back panel. The rock wool is to be a minimum of 1/2 inch from the surface of the perforated panel and shall fill the panel cavity and be 2 inches thick. It shall have a density of 6-lbs. per cu.ft. and conform with ASTM standard E-136. The mineral rock wool sound-absorbing material shall absorb less than 1% water, be noncorrosive, melt about 2,000 Deg.F., have a flame spread of 15 or less and a smoke development of 0 when tested in accordance with ASTM standard E-84, be rated noncombustible by ASTM standard E-136, be non-hygroscopic, and have a NRC of 1.05.

1.3 MATERIALS

A. Panels shall be fabricated from 22 to 16 gauge sheet steel conforming to the structural quality of ASTM A-446 and galvanized in accordance with ASTM A-525, Class G-90. Each panel shall have a width of 12 inches and a thickness of 2 ¾ inches or 3 ¾ inches.

B. The individual panels shall be “nested” horizontally into structural members. The panels may be installed vertically or horizontally in heights up to 12 feet before intermediate girts may be required. Interior perforated side of panel is to be galvanized. Exterior panels are to be galvanized and finished with the following coil coating. The panel system can be galvanized or a combination of galvanized and pre-coated elements depending upon customer requirements; i.e., galvanized face panel and pre-coated back tray or pre-coated face panel and galvanized back tray.

END OF SECTION

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DIVISION 14: CONVEYING EQUIPMENT

142100 ***Electric Traction Elevators***
142400 Hydraulic Elevators

SECTION 142100

ELECTRIC TRACTION ELEVATORS

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for electric traction passenger elevators.

1.2 QUALITY ASSURANCE

A. Regulatory Requirements
1. ASME A17.1 “Safety Code for Elevators and Escalators.”

1.3 COMPONENTS

A. Passenger Elevator Machines: Either variable-voltage, variable-frequency ac or variable-voltage dc type; with solid-state power converters.

B. Elevator Description:
1. Auxiliary Operations: Battery-powered lowering or standby powered lowering.
2. Security Features: Card-reader or keyswitch operation.
3. Car Enclosures:
a. Front Walls (Return Panels): Stainless Steel
b. Side and Rear Wall Panels: Plastic Laminate
c. Doors: Enameled Steel

C. Signal Equipment
1. Emergency communication system complying with ASME A 17.1 and the U.S. Architectural and Transportation Barriers Compliance Board’s “American with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG).”

LEED SUGGESTIONS

2.1 Energy consumption is the primary environmental concern with elevators. Careful selection of elevator type, controllers, and machines can have a significant impact on elevator energy consumption. Electric traction elevators use far less energy than hydraulic elevators. Solid-state power conversion uses less energy than the motor generators of the past, VVVF ac systems use less energy than dc systems, and regenerative systems will reduce power consumption more than non-regenerative systems. Sophisticated microprocessor operation systems can reduce energy requirements through more efficient elevator system operation and may also reduce embodied energy by requiring fewer elevators. When life-cycle costs, rather than just initial costs, for elevator systems are considered, many of these energy-saving features will prove to be cost-effective.

END OF SECTION

SECTION 142400

HYDRAULIC ELEVATORS

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for hydraulic passenger elevators.

1.2 QUALITY ASSURANCE

A. Regulatory Requirements
1. ASME A17.1 “Safety Code for Elevators and Escalators.”

1.3 COMPONENTS

A. Pump Units: Mounted on oil tank in steel enclosure or submersible pump, suspended inside tank.
1. Motor: Solid-state starting.

B. Cylinder Protection: PVC or HDPE pipe casing.

C. Signal Equipment
1. Car Control Stations: Semi-recessed or recessed type, one per car.
2. Emergency Communication System must comply with ASME A 17.1 and ADAAG.

D. Elevator Description
1. Auxiliary Operations
a. Battery-Powered Lowering.
2. Security Features: Card-reader operation or keyswitch operation.
a. Front Walls (Return Panels): Stainless steel.
b. Side and Rear Wall Panels: Enameled steel or plastic laminate.
c. Doors: Enameled steel.
d. Ceiling: Luminous ceiling.
e. Handrails: Stainless steel.

END OF SECTION

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FIRE SUPPRESSION

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DIVISION 21: FIRE SUPPRESSION

211000 Water-Based Fire-Suppression Systems

SECTION 211000

WATER-BASED FIRE SUPPRESSION SYSTEMS

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for piping systems, sprinkler equipment, fire pumps, controls, tank and accessories, standpipes/hose cabinets, and double detector check valves.

1.2 SUBMITTALS

A. Submittals are required and shall include product data noting materials, sizes, and materials. Submit hydraulic calculations and drawings showing the sprinkler piping layout with the sprinkler designer's registration seal.

1.3 QUALITY ASSURANCE

A. Piping shall be installed per NFPA 13, state and local fire codes.

B. Testing of the piping shall be per NFPA 13.

C. Sprinkler heads shall be UL and FM labeled and shall be located on spacing requirements as noted in NFPA 13 according to the hazard designation. Extended coverage sprinkler heads are acceptable.

D. Fire pumps shall be UL and FM labeled.

E. Stand pipes and hose cabinets shall be provided per NFPA 14, state and local codes.

F. Backflow preventers shall meet the current requirements of ASSE 1015, ASSE 1047 and/or ASSE 1048.

1.4 PIPING SYSTEMS

A. Piping to include schedule 40 black steel and/or schedule 10 thin wall steel.

B. Grooved piping with ductile iron couplings and EPDM gasket may be used in lieu of threaded pipe.

C. An option to the final connection to the sprinkler head shall be flexible braided stainless steel hose assembly per UL, FM, and NFPA 13 requirements.

1.5 SPRINKLER EQUIPMENT

A. The types of heads shall be used in the following locations;
   1. Unfinished exposed spaces and mechanical spaces - brass heads.
   2. Finished spaces with ceilings – concealed or semi recessed heads.
   3. Finished spaces in storage rooms and janitor closets - white pendent heads.
   4. Corridors, locker/shower rooms, restrooms - concealed white head assemblies.
   5. Heads in the gym shall have wire guards.
   6. If heads are exposed in the locker/shower rooms, use a wire guard on each head.

B. Provide vane type water flow indicator with tamper switch and electronic retard.

C. Provide valve position supervisory switch for monitoring all valves.

D. Provide test station with valve and drain assembly for testing sprinkler system.

E. Provide a fire department siamese connection on the exterior of the building or a free standing siamese post for connection to the building sprinkler system.

F. Provide a wall indicator wall or post indicator valve for shutoff of the sprinkler system supply. The valve shall be supervised with a tamper switch.

1.6 FIRE PUMPS, CONTROLS, AND ACCESSORIES

A. Provide a UL labeled fire pump, controls and accessories.

B. The fire pump shall be [vertical turbine] [horizontal split case] [vertical in line] fire pump.

C. Power to the pump shall be [limited service electric motor] [shaft coupled diesel engine].

D. Controls shall be for a limited service motor.

E. A transfer switch shall be provided if there is more than one power supply feeding the fire pump.

F. The jockey pump shall be provided to pressurize the piping system for detection of a head activating by a fire or by a trouble condition.

G. In the case of a condition where a local water supply must be provided, a tank or tanks shall be installed to provide an adequate amount of water to fight a fire based on NFPA 13 requirements for the flow rate and duration based on the hazard designation. Types of tanks shall include concrete or fiberglass. Level controls shall be installed in the tank to maintain the water level and indicate an alarm for an inadequate water supply.

1.7 STANDPIPES/HOSE CABINETS

A. Cabinets on the stage shall be surface mounted.

1.8 DOUBLE DETECTOR CHECK VALVES

A. The double detector check valve assembly shall consist of two spring loaded double check valves, with a cast iron body with epoxy lining or stainless steel body UL and FM approved. Provide a detector water meter if required by the local fire authority. Provide inlet and outlet resilient seated O.S. & Y. gate valves. Provide bypass piping with test cocks. Provide inlet and outlet pressure gauges.

1.9 INSTALLATION

A. Piping shall be installed from approved hangers located at steel joist panel points.

B. When required by inadequate water pressure and flow conditions, furnish and install the fire pump, jockey pump, controls, transfer switch and required piping.

C. Piping in gymnasiums shall be above the bottom chords of the roof structure.

D. Heads in the corridors shall be centered between the corridor walls. All others heads in the finished spaces with ceilings shall be located within 6 inches of the ceiling grid.

E. Install double detector check assembly with water meter on the incoming water supply to the sprinkler system.

F. Clean pipe to prevent MIC (microbially influenced corrosion).

END OF SECTION

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PLUMBING

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DIVISION 22: PLUMBING

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221500 Compressed Air System
223100 Domestic Water Softener Equipment
223200 Domestic Water Filtration Equipment
223400 Fuel-Fired Domestic Water Heaters
224000 Plumbing Fixtures
226313 Gas Piping ***Systems***

SECTION 220519

METERS AND GAGES FOR PLUMBING PIPING

GENERAL ***GUIDELINES***

1.1 SECTION INCLUDES

A. Qualitative requirements for thermometers and fittings, as well as pressure gauges and fittings.

1.2 SUBMITTALS

A. Submittals are required and shall include product data noting materials, sizes, and dimensions.

1.3 COMPONENTS

A. Thermometers: 1-percent accuracy.
1. Liquid-in-Glass Type: Organic filled 9 inch long industrial type.
2. Direct-Mounting Filled-System Dial Type: Vapor actuated, thermal bulb, precision brass gear.
3. Remote-Reading, Filled-System Dial Type: Vapor actuated, thermal bulb; precision brass gear.
4. Bimetal Dial Type: Direct mounting, bimetal coil.
5. Insertion Dial Type: Bimetal coil.

B. Pressure Gauges: Phosphor-bronze Bourdon-tube gages, 1-percent accuracy.
1. Vacuum Range: 30 inches Hg of vacuum to 15 psig of pressure .
2. Pressure Range: Two-times operating pressure.

1.4 INSTALLATION

A. Provide thermometers at the following locations:
1. Inlet and outlet domestic water heaters.
2. Outlet of the hot water storage tank.
3. Inlet and outlet hot water at the main thermostatic mixing valve.
4. Domestic circulation pump outlet.

B. Provide pressure gauges at the following locations:
1. Outlet piping of each water heater with 200 MBH input or greater.
2. Inlet and outlet of the main reduced pressure backflow preventer.

END OF SECTION

SECTION 220533

ELECTRIC SELF-REGULATING HOT WATER TEMPERATURE MAINTENANCE CABLE

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for hot water maintenance cable.

1.2 SUBMITTALS

A. Submittals are required and shall include product data noting materials, sizes, and dimensions.

1.3 QUALITY ASSURANCE

A. Follow manufacturer's requirements for installation.

B. Cable shall be UL listed, CSA certified and FM approved.

C. Cable system shall conform to ANSI/IEEE Standard 515.1.

D. Cables designed for freeze protection of water lines will not be allowed.

1.4 WARRANTY

A. Cable – Minimum 10 year warranty.

B. Follow manufacturer's installation and testing requirements.

1.5 MAINTENANCE CABLE

A. The self-regulating cable shall consist of (2) nickel-coated copper bus wires embedded in a radiation cross-linked conductive polymer core. The cable shall be capable of varying its heat output along its entire length to maintain the water in the selected temperature range.

B. Provide electronic controller for temperature control and energy savings.

1.6 INSTALLATION

A. Refer to the manufacturer's hot water temperature maintenance design guide for design details, insulation requirements, maximum circuit lengths, and accessory information.

B. The cable shall not be installed in a concealed space.

END OF SECTION

SECTION 221116

DOMESTIC WATER PIPING SYSTEM

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for domestic water piping.

1.2 SUBMITTALS

A. Submittals are required and shall include product data noting materials, sizes, and dimensions.

1.3 QUALITY ASSURANCE

A. Follow manufacturer's requirements for installation.

B. Welding procedures per ANSI/ASME Section 9, AWS D10.9 and D1.1 and the National Certified Pipe Welding Bureau.

C. Brazing procedures per ANSI B31.5 and the ASME Boiler and Pressure Vessel Code SFA-5.8, Section II.

D. Soldering procedures per ANSI B16.18.

E. Comply with ANSI B31 pressure code for pressure piping.

1.4 PLUMBING PIPING

A. Domestic water piping (hot water, cold water, hot water return) shall be type L copper conforming to ASTM B88. Fittings shall be wrought copper conforming to ANSI B16.22.
   1. Grooved copper piping with ductile iron or bronze couplings and EPDM gasket may be used as an option.
   2. Copper press fittings may be used as an option per ASTM B16.18 or ASTM B16.22. O-Rings shall be EPDM.

1.5 INSTALLATION

A. Provide pipe and tube of type, joint type, size and weight (wall thickness or class) indicated for cold water, hot water, and hot water return.

END OF SECTION

SECTION 221119

DOMESTIC WATER PIPING SPECIALITIES

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for vacuum breakers, backflow preventers, plumbing thermostatic mixing valves, strainers, outlet boxes, hose bibbs, wall hydrants, water hammer arresters, trap-seal primer systems, domestic hot water return balancing device (manual), and clothes washer connection.

1.2 SUBMITTALS

A. Submittals are required and shall include product data noting materials, sizes, and dimensions.

1.3 QUALITY ASSURANCE

A. Vacuum breaker wall hydrants and freeze resistant wall hydrants shall meet ASSE Standard 1019.

B. Provide backflow prevention devices wherever possible sources of undesirable materials are connected to the potable water system.

C. The backflow prevention devices shall meet the standards set by the American Society of Sanitary Engineers and the latest edition of the Plumbing Code and air gap standards under American National Standards Institute A112.1.2-1943(1979).

D. The backflow prevention devices shall be approved for use by the Foundation for Cross-Connection Control and Hydraulic Research at the University of Southern California.

E. Atmospheric vacuum breaker per ANSI/ASTM 1020.

F. Hose connection vacuum breaker per ASSE 1011 and CSA B64.2.

G. Reduced pressure vacuum breaker per ASSE 1013, AWWA C511, CSA B64.5.

H. Pressure type backflow preventer per ANSI/ASSE 1035.

I. Dual check valve per ANSI/ASSE 1024, CSA B64.6.

J. Thermostatic mixing valves shall meet the Ohio Plumbing Code and the requirements of ASSE 1017.

K. Strainers shall meet NSF 61 and ASTM B 62.

L. Hose bibbs and wall hydrants shall meet ASSE 1019.

M. Water hammer arresters shall meet ANSI/ASME A112.26.1M and ASSE 1010.

N. Trap seal primers shall meet ASSE 1018.

O. Clothes washer connection shall meet ANSI/ASSE 1035.

P. Emergency mixing valves shall meet ANSI 2.358.1-1998.

1.4 COMPONENTS

A. Atmospheric vacuum breaker shall have brass body, stainless steel working parts, integral strainer, rubber discs, maximum pressure, maximum 175 psi operation, unions.

B. Hose connection vacuum breaker shall have ¾ inch female hose inlet connection, ¾ inch male outlet connection, non-removal feature, plain brass finish.

C. Reduced pressure backflow preventer shall have fused epoxy coated cast iron check valve body and relief valve, replaceable bronze seats, bronze ball check valve test cocks, maximum 175 psi operation, stainless steel internal parts, air gap connection for relief piping to drain.

D. Pressure type backflow preventer shall have atmospheric vent, all brass construction, in-line continuous operation, maximum 125 psi operation.

E. Dual check valve shall have straight line poppet type check modules, replaceable seats, brass construction.

F. Water Hammer Arresters: Shall be the stainless steel bellow type.

G. Balancing devices shall be bronze with adjustable control.

H. Domestic hot water anti-scald thermostatic mixing control valve unit shall include swivel action check stops, removable cartridge with strainer, stainless steel piston and liquid fill thermal motor with bellows element mounted out of water. The mixing valve shall control the domestic hot water temperature distributed throughout the building. The mixing valve shall have a thermostatic sensing unit. The mixing valve shall fail to the cold water side. Flow rate shall determine whether a single valve shall be required or a high/low valve with pressure reducing valves is required to provide the correct temperature at the minimum and maximum hot water flow in the building.

I. Strainers: Shall be bronze threaded, flanged, or soldered.

J. Outboxes: Shall be recessed with pressure backflow preventer.

K. Hose bibbs and Wall Hydrants: Shall be recessed or surface with vacuum breakers.

L. Exterior Wall Hydrants: Shall be non-freeze, self-draining with copper/bronze construction with recessed wall box with loose key.

M. Clothes Washer Connection Box and Refrigerator Supply: Metal recessed box complete with hot and/or cold water shut-off valves and drain connection.

N. Emergency thermostatic mixing valve: shall be liquid or bi-metal thermostats, cold water bypass, high limit stop, locked temperature regulator.

1.5 INSTALLATION

A. Provide vacuum breakers on all threaded hose bibb connections.

B. Install reduced pressure principle backflow preventer in irrigation and incoming domestic water service.

C. Install pressure type vacuum breakers in lines under continuous pressure and at least 12 inches above the highest outlet downstream of the unit.

D. Provide drain line from reduced pressure backflow preventer discharge outlet; extend to nearest drain.

E. Units shall be installed in strict accordance with manufacturer's written instructions.

F. Test each backflow device and submit test data.

G. Provide thermostatic mixing valves to regulate the hot water temperature to a fixture.

H. Provide a recessed washer box ***at*** each domestic clothes washer.

I. Provide a recessed box to supply water to each refrigerator.

J. Wall hydrants with hose connections shall be provided in the mechanical room and boiler room.

K. Provide a water hammer arrestor at each solenoid valves or piece of equipment that has a quick closing type valve. Water hammer arrester for down-feed risers to be at top of riser. Size shock absorber according to fixture unit count. Provide shock absorbers at each group of water closets and urinals. Shock absorber shall be easily accessible for repair or replacement.

L. Provide trap seal primers on all floor drains to prevent trap seals from drying up.

M. Provide emergency thermostatic mixing valve with inlet and outlet thermometers to regulate tempered water to the emergency eye wash and/or showers.

END OF SECTION

SECTION 221123

PLUMBING PUMPS AND ACCESSORIES

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for recirculation pumps and water pressure booster pump system.

1.2 SUBMITTALS

A. Submittals are required and shall include capacities, warranties, product data noting materials, sizes, and dimensions.

B. Pressure booster system panel shall be UL listed and labeled.

1.3 QUALITY ASSURANCE

A. Each pump shall be capable of providing the scheduled flow in gpm and head required.

B. Pump motors shall be high efficiency type.

C. All three-phase motors shall be protected with phase loss protection. Protection shall be provided by the electrical system, by built-in protection, or by protection built into a variable frequency drive.

1.4 RECIRCULATION PUMPS

A. The pump shall be all bronze, horizontal in line, oil lubricated, and 125 psi working pressure.

B. Aquastat with voltage thermostat shall start/stop pump or start/stop by the temperature control system.

1.5 WATER PRESSURE BOOSTER PUMP SYSTEM

A. The pump system shall consist of two pumps providing a constant water pressure to the piping system. The control system shall provide alternation of the pumps, on/off operation and an alarm system.

B. Provide expansion pressure tank with a bladder insert for storage capacity required, sized accordingly to meet flow requirements.

1.6 INSTALLATION

A. Provide the correct gpm, head and voltage required.

1. Inlet piping shall consist of a line size valve and strainer. Outlet piping shall consist of a line size check valve and valve.
2. The pump shall be supported by the inlet and outlet piping.

B. Pressure Booster System

1. Install the pressure booster pump system according to the manufacturer's recommendations. Provide inlet and outlet piping and valves. Install the expansion tank with size as required.

END OF SECTION

SECTION 221316

SANITARY PIPING SYSTEM

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for sanitary piping and vent, as well as acid waste piping and vent.

1.2 SUBMITTALS

A. Submittals are required and shall include product data noting materials, sizes, and dimensions.

1.3 QUALITY ASSURANCE

A. Follow manufacturer's requirements for installation.

B. Obtain list of Owner's chemicals to review against pipe material chemical resistance chart for acid waste piping.

1.4 SANITARY AND VENT PIPING

A. Sanitary and vent piping materials below slab
   1. Schedule 40 PVC with solvent joints per ASTM D2665, D2564, D2665.
   2. Cast iron hub and spigot per ASTM A74 and C 564.

B. Sanitary and vent piping above finish floor.
   1. Schedule 40 PVC with solvent joints per ASTM D2665, D2564, D2665.
   2. Cast iron no hub and fittings per ASTM.

C. Sanitary and vent piping above ceiling in plenum space
   1. Cast iron no hub and fittings per ASTM.
   2. PVC piping is not permitted in a return air plenum or in a chase exposed to the plenum.

D. Acid waste piping below slab and above slab.
   1. Schedule 40 polypropylene per ASTM D4101 and ASTM 3311.
   2. Schedule 40 CPVC with solvent joints per ASTM ***D1784***, F493, ***F441,*** D3311, and NSF ***Standard 14.***

E. Acid waste piping in plenum space ***and chases open to plenums***
   1. Schedule 40 polyvinylidene fluoride per ASTM D3222 or glass per ASTM C1053-90.

F. Underground waste and vent piping in kitchen space.
   1. Cast iron hub and spigot.

1.5 INSTALLATION

A. Terminate vent piping through roof, a minimum of 12 inches above the roof.

B. Location of vent on the roof shall be a minimum of 20 feet from any rooftop or wall louver outside air intake or rooftop HVAC equipment outside air intake.

END OF SECTION

SECTION 221323

GREASE/OIL/ACID INTERCEPTORS

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for grease interceptors, solids interceptors, clay traps, and acid waste neutralizing sumps.

1.2 SUBMITTALS

A. Submittals are required and shall include product data noting materials, sizes, and dimensions.

1.3 QUALITY ASSURANCE

A. Grease interceptors, solid interceptors, and clay traps shall meet the latest edition of PDI Seal of Approval and Ohio Plumbing Code.

B. Acid sump shall meet Ohio Plumbing Code.

1.4 GREASE INTERCEPTORS

A. The interceptor shall be a minimum of 500 gallons, constructed of concrete, cast iron, or fiberglass. Verify size with local health authority.

B. Provide cleanouts at each end of the tank with access up to grade.

C. Provide access to grade, using a 2'-0" diameter concrete collar with a cast iron frame and lid, 4 inches above finish grade.

1.5 SOLIDS INTERCEPTORS

A. Interceptors shall be acid resistant coated fabricated steel, heavy duty cover. Provide extension to finish floor as required.

1.6 CLAY TRAPS

A. Clay trap shall be acid resistant coated fabricated steel, stainless steel mesh screen basket, gasketed cover.

1.7 ACID NEUTRALIZING SUMP

A. Tank shall be polypropylene or HDPE with bolt down gasketed lid, inlet and outlet piping, vent, flanged connections.

B. Provide access to grade, using a 5'-0" diameter concrete or corrugated metal collar with a cast iron frame and lid in a 6 inch thick reinforced concrete cover, 4 inches above finish grade.

C. A single 5 gallon sump can be specified for a single sink requiring acid neutralization.

1.8 GREASE INTERCEPTORS

A. Provide a minimum of 2'-0" cover over the tank.

B. Set tank on a 6 inch bed of compacted granular material. Backfill around the tank to within 12 inches of grade with compacted granular material.

C. The interceptor shall be located on the exterior of the building, 10'-0" minimum distance from the building.

D. Do not locate the interceptor in a drive area without providing adequate support over the tank.

E. Vent the interceptor into the building, up through the roof.

1.9 SOLIDS INTERCEPTORS

A. Piping invert under the floor to the tank will determine if an extension of the interceptor will be required to meet finish floor elevation.

B. Provide adequate clearance above the lid for cleaning and basket removal.

C. The interceptor can be located on or in the floor slab.

D. Provide access to the lid for cleaning.

1.10 CLAY TRAPS

A. Provide adequate clearance above the lid for cleaning and basket removal.

B. If the trap is installed within the casework, set on floor inside the base cabinet. Adjust the outlet piping extending to the wall to meet the invert.

C. Cleaning of the trap shall not constitute removal of the trap.

D. Piping connections shall have unions.

1.11 ACID NEUTRALIZING SUMP

A. Set basin on a 6 inch concrete slab, with the diameter the same as the outside diameter of the collar.

B. Provide stone around the basin, to just below the lid.

C. The access lid shall allow the removal of the basin lid. Size accordingly.

D. The lid and frame shall be set in a 6 inch concrete lid, 12 inches in diameter larger than the collar.

E. Fill the sump with water and the required amount of limestone chip, with size as recommended by the manufacturer.

F. Piping connections to the tank shall be flanged.

G. The sump shall be located on the exterior of the building, 10'-0" minimum distance from the building.

H. Do not locate the interceptor in a drive area without providing adequate support over the tank.

I. Vent the acid sump into the building, up through the roof.

1.12 SINGLE AND NEUTRALIZING SUMP (1 sink)

A. Provide adequate clearance above the lid for cleaning and basket removal.

B. If the trap is installed within the casework, set on floor inside the base cabinet. Adjust the outlet piping extending to the wall to meet the invert.

C. Cleaning of the sump shall not constitute removal of the trap.

D. Fill sump with water and limestone chips.

E. Piping connections shall have unions.

END OF SECTION

SECTION 221413

STORM PIPING SYSTEM

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for storm piping.

1.2 SUBMITTALS

A. Submittals are required and shall include product data noting materials, sizes, and dimensions.

1.3 QUALITY ASSURANCE

A. Follow manufacturer's requirements for installation.

1.4 STORM PIPING

A. Storm piping materials below slab
   1. Schedule 40 PVC with solvent joints per ASTM D2665, D2564, D2665.
   2. Cast iron hub and spigot per ASTM A74 and C 564.

B. Storm piping above finish floor.
   1. Schedule 40 PVC with solvent joints per ASTM D2665, D2564, D2665.
   2. Cast iron no hub and fittings per ASTM.

C. Storm piping above ceiling in plenum space
   1. Cast iron no hub and fittings per ASTM.
   2. PVC piping is not permitted in a return air plenum or in a chase exposed to the plenum.

1.5 INSTALLATION

A. Connect to roof drains and/or secondary roof drains as required.

END OF SECTION

SECTION 221500

COMPRESSED AIR SYSTEM

GENERAL GUIDELINES

1.1 SECTION INCLUDES
A. Qualitative requirements for compressed air piping, compressor, regulator, and air dryer.

1.2 SUBMITTALS
A. Submittals are required and shall include product data noting materials, sizes, and dimensions.

1.3 QUALITY ASSURANCE
A. Follow manufacturer's requirements for installation.

B. Comply with ANSI B31 pressure code for pressure piping.

1.4 COMPRESSED AIR PIPING
A. Compressed air piping shall be galvanized steel, schedule 40, per ASTM A53. Fittings shall be threaded, class 150 per ASME A733 and B1.20.1.

1.5 AIR COMPRESSOR
A. Provide single or two stage air compressor as required by air pressure requirements.

B. Provide vibration isolation.

C. Consider noise factor as to where compressor is placed.

D. Provide ASME constructed air tank.

E. Provide air cooled after cooler.

F. Provide inlet and outlet valves, unions, and flexible connections.

1.6 AIR REGULATOR
A. Provide quick disconnect hoses.

B. Provide valve to each drop.

1.7 AIR DRYER
A. Provide air dryer to match air compressor CFM.

B. Provide refrigerated unit with high temperature inlet capabilities.

C. Provide inlet and outlet valves, unions, and flexible connections.

1.8 INSTALLATION
A. Branch air connection shall connect to the top of the air main.

B. Provide proper CFM air regulator to match system use.

END OF SECTION

SECTION 223100

DOMESTIC WATER SOFTENER EQUIPMENT

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for the water softener system.

1.2 SUBMITTALS

A. Submittals are required and shall include product data, noting materials, sizes, and dimensions.

1.3 QUALITY ASSURANCE

A. The water softener shall meet with the approval of the OEPA when installed in association with a water well.

B. The softener shall be sized to meet the requirements concerning the amount of water to be softened between regenerations based on the grains hardness.

1.4 WATER SOFTENER SYSTEM

A. The tank shall be fiberglass, rated for 100 psi working pressure.

B. The backwash distributor shall be of the radial hub design.

C. The control valve shall initiate regeneration, backwash, rinse, brine draw and brine tank refill. Initiation of the regeneration sequence shall be by a volumetric water meter coupled to a timer control, preset at a specific gallons used. The timer will not let the regeneration begin until a preset time.

D. The mineral tank will be provided with a correct amount of resin, having a minimum exchange rate of 30,000 grains when regenerated with 15 lbs of salt per cubic foot.

E. A hardness test kit shall be included with the softener.

1.5 INSTALLATION

A. Provide and install the softener complete with inlet and outlet valves and unions, and bypass piping around the inlet and outlet connections.

B. Install sampling tees/valves in inlet and outlet piping to the mineral tank for testing the water.

END OF SECTION

SECTION 223200

DOMESTIC WATER FILTRATION EQUIPMENT

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Quantitative requirements for the iron filter system.

1.2 SUBMITTALS

A. Submittals are required and shall include product data noting materials, sizes, and dimensions.

1.3 QUALITY ASSURANCE

A. The iron filter system shall meet with the approval of the OEPA when used in conjunction with a water well.

B. The iron filter shall be sized to meet the requirements concerning the amount of water to be filtered between regenerations based on the iron content.

C. The iron filter system shall remove all ferrous, ferric or bacterial iron from the incoming water supply without the use of chemicals.

1.4 IRON FILTER SYSTEM

A. The main service valve shall be diaphragm operated. No raw water bypass is allowed. If controller maintenance is required, the system will remain in service.

B. An automatic flow controller shall be provided to maintain backwash and rinse rates over variable operating pressures.

C. A factory assembled cycle controller shall incorporate an adjustable time switch with multi-ported pilot valve to control all steps of automatic regeneration with provisions for manual regeneration.

D. The muti-ported pilot control valve shall automatically pressure activate the main operating service/backwash valves through the steps of regeneration and return to service. In the event of a power failure, a complete regeneration can be performed by manual operation of the pilot valve.

E. The electrical time clock shall be adjustable to initiate regeneration at any time of the day and any number of days in a minimum of a 12 day period.

F. The mineral shall require no chemical regeneration. Periodic regeneration shall only be required.

G. The air induction system to introduce oxygen into the water for the oxidation process shall be of the venturi type. Forced air injection is not acceptable.

H. Attrition loss of mineral shall not exceed 3 to 5 percent per year.

I. The distribution shall be factory installed with a washed quartz gravel bed.

1.5 INSTALLATION

A. Install all equipment and associated piping and valves.

B. Install sampling tees/valves in the inlet and outlet piping to the mineral tank for testing the water.

C. Provide bypass piping around the inlet and outlet connections.

END OF SECTION

SECTION 223400

FUEL-FIRED DOMESTIC WATER HEATERS

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for instantaneous gas fired water heaters, hot water storage tanks, electric booster heater, tank type under fired heaters, and combination power vented heaters installed in a common tank.

1.2 SUBMITTALS

A. Submittals are required and shall include product data noting materials, sizes, and dimensions.

1.3 QUALITY ASSURANCE

A. Gas units shall meet CSA requirements.

B. Units must meet ASHRAE 90.1, ADDM 90 1 b.

C. The gas heater shall be ASME certified for 125 psi operation and National Board listed.

D. Heater shall be rated at a minimum of 82 percent thermal efficiency.

1.4 WARRANTY

A. Water heater heat exchanger - 5 year.

B. Storage tank - 5 year limited.

C. Booster heater - 3 year limited.

D. Combination heat exchanger/storage tank – 5 year.

E. Gas-fired units shall have sealed combustion.

1.5 INSTANTANEOUS GAS FIRED WATER HEATER

A. Two pass copper fin tubes.

B. Cast iron headers.

C. Built-in draft diverter.

D. Insulated jacket.

E. ASME temperature and pressure relief valves.

F. Electronic controls.

G. Integral bronze circulation pump.

H. Flow switch.

I. Electronic ignition.

J. Cupro nickel heat exchanger.

1.6 HOT WATER STORAGE TANKS

A. Vertical storage tank.

B. Glass lining.

C. ASME constructed.

D. Insulated.

E. 150 psi work pressure.

D. Inlet and outlet piping.

1.7 COMBINATION 2 HEATERS AND STORAGE TANK

A. Vertical storage tank.

B. Polymer-lined tank.

C. ASME constructed.

D. Insulated.

E. 150 psi working pressure.

F. Inlet and outlet piping.

G. Submerged combustion heat exchangers.

H. Electronic flame safeguard.

1.8 ELECTRIC BOOSTER HEATERS

A. The tank construction shall have a 150 psi working pressure. The interior of the tank shall be glass lined. The jacket surrounding the tank shall be stainless steel front with baked enamel sides and back with 6 inch adjustable legs

B. The control circuit shall consist of a pilot switch with indicator light, built in thermostat and hi-limit, and magnetic contactors.

C. Heater elements shall be copper-sheathed, furnished with 4 bolt flange for disassembly without removing the booster head.

D. Provide ASME temperature and pressure relief valve, temperature and pressure gauge.

1.9 TANK TYPE UNDER FIRED HEATER

A. Multi-flue design.

B. Working pressure - 150 psi.

C. Glass lined.

D. ASME constructed.

E. Insulated with minimum 2 inch foam insulation.

F. Heavy jacket.

G. Vent damper control.

H. Spark ignition.

1.10 INSTALLATION

A. The heater shall be designed to produce the required gallons per hour at the temperature required based on the Btu input.

B. Where two or more heaters are shown, pipe for equal flow through the heaters. Provide unions and shutoff valves at each heater connection.

C. Follow manufacturers recommendations for installation, space requirements, and piping sizing.

D. Provide temperature and pressure gauge in the upper 1/3 portion of the tank.

E. The booster heater shall boost the 140 degree water to 180 degrees for the dishwasher final rinse.

E. Time of day control shall be provided to disable domestic water heater system when building is unoccupied.

END OF SECTION

SECTION 224000

PLUMBING FIXTURES

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for plumbing fixtures and plumbing specialties.

1.2 SUBMITTALS

A. Submittals are required and shall include product data noting materials, sizes and dimensions.

1.3 QUALITY ASSURANCE

A. Meet requirements of the current Plumbing Code.

B. Water closets shall meet ANSI A112.19.1M. Trim shall meet ANSI A112.19.5.

C. Urinal shall meet ANSI 2124.4, ASME A112.19.2M, and ASME A112.19.6. Trim shall meet ANSI A112.19.5. The optional waterless urinal shall meet ASTM A112.19.2M and A-117.1 and 1APMO 1 GC 161-2000 and ANSI Z124.9-94.

D. Lavatories shall meet ANSI A112.19.1M and Z 124.3.

E. Drinking water coolers shall meet ANSI A112.19.2M.

F. Sink shall meet ANSI A112.19.1M and A112.19.2M.

G. Sinks shall meet ANSI A112.19.1M and A112.19.2M.

H. All fixtures shall meet the governmental regulations for low-flow operation.

I. Drinking fountains shall meet ASME A112.19.1, A112.19.2, or A112.19.9, and ANSI 117.1.

J. Drinking water coolers shall meet ARI 1010 and ANSI 117.1.

1.4 PLUMBING FIXTURES AND SPECIALTIES

A. Water closets shall be wall mounted, white vitreous china with white seat and flush valve. Water closets for kindergarten students can be floor mounted. Automatic/battery or direct wired flush valve is optional.

B. Urinals shall be white vitreous china with flush valve. Automatic/battery or direct wired flush valve is optional. An option to the urinal with flush valve shall be the waterless type vitreous china urinal with a removable ABS plastic trap.

C. Lavatories shall be wall hung, white vitreous china with hot and cold blade handle faucet on 4 inch centers. An option to the lever handles shall include commercial grade single lever faucets with a ceramic disc. An option to the lever handle faucet shall be a battery or hardwired infrared faucet.

D. Showers shall be pressure balancing, single lever with vandal resistant shower head.

E. Drinking water coolers and fountains shall be wall mounted and shall meet ADA requirements.

F. Sinks shall be 302 or 304 stainless steel, single, double, or triple compartment with faucet with hot and cold blade handles and swing spout. An option to the lever handles shall include commercial grade single lever faucets with a ceramic disc.

G. Science lab sinks shall be acid resistant for high school applications. Provide acid resistant strainer and tailpiece. Science casework contractor shall provide sink and trim.

H. Service sinks shall be floor mounted molded stone, 10 A high, 24" x 24", 3" outlet and a wall faucet with pail hook and vacuum breaker.

I. Washfountains shall be terrazzo or stainless steel or modified acrylic (complying with ANSI 2124.3 and ANSI 2124.6) with infrared sensing for water activation, ADA accessible, and floor or wall mounted.

J. Emergency eye wash shall be wall mounted, ADA accessible and set at ADA height. ***Also provide supply from thermostatic mixing valve per ANSI Z358.1, latest edition.***

K. Emergency shower shall have a 10 inch diameter shower head, vertical or horizontal supply and have a ADA accessible handle. ***Also provide supply from thermostatic mixing valve per ANSI Z358.1, latest edition.***

1.5 PLUMBING FIXTURES AND SPECIALTIES (cont.)

O. Provide a stainless steel, wall mounted drinking fountain for exterior installations. Unit shall be freezeproof, have push button activation and be ADA accessible. Mount to the exterior building wall.

1.6 INSTALLATION

A. Lavatories, water closets, and urinals shall have carriers attached to the floor.

B. All fixtures and trim so noted for handicap installation shall meet ADA requirements.

C. Clay trap installation for an ADA sink shall not interfere with the space requirements under the sink. Locate next to the sink casework.

D. The power transformer for the washfountain shall be a plug-in type located within the housing of the washfountain, and plugged into a duplex receptacle.

END OF SECTION

SECTION 226313

GAS PIPING ***SYSTEMS***

GENERAL GUIDELINES

1.1 SECTION INCLUDES

A. Qualitative requirements for natural gas piping, gas valves, and gas regulators.

1.2 SUBMITTALS

A. Submittals are required and shall include product data noting materials, sizes, performance ratings, and installation instructions.

1.3 QUALITY ASSURANCE

A. Conformance to National Fuel Gas Code.

B. Material and installation requirements shall follow NFPA 54, state and local gas company codes.

C. Conformance to ANSI B31.

D. Gas regulators shall be AGA rated.

1.4 GAS PIPING

A. Gas piping shall be schedule 40 black steel piping.

B. Gas piping installed external to the building from the service main to the gas meter shall be as per the gas company requirements.

C. Final connection from the building gas piping system to the gas turret in the science room can be corrugated stainless steel tubing per NFPA 54, state and local gas company requirements.

1.5 GAS VALVES

A. Gas valves 2 inches and smaller shall be full port all brass screwed gas service stops with lever handles and check.
1. (option) Gas valves 2” and smaller may be ¼ turn ball valves.

B. Gas valves 2-1/2 inches and larger shall be semi-steel, straightway flanged, 125 pounds swp, square head wrench operated, lubricated plug valve.

C. Kitchen Hood – Spring loaded (N.C.) gas valve or manual reset electric solenoid valve.

D. In the science and art rooms, provide the following:
1. A manual reset, solenoid operated shut-off valve with 120v operation with remote push button operation and fire alarm system activation.

1.6 GAS REGULATORS

A. Gas regulators shall be die cast aluminum alloy diaphragm, external vent connection, interchangeable brass orifices, cast iron body, Buna-N with nylon fabric insert diaphragm.

1.7 INSTALLATION

A. Unions and valves are not permitted in the gas piping in a return air plenum.

B. Piping 1-1/2 inches and smaller shall have threaded joints.

C. Piping 2 inches and larger shall have welded joints.

D. All regulators shall be separately vented full size to the exterior, with a turndown elbow and insect screen. Vent outlet shall not terminate next to a combustion or fresh air intake.

E. Provide a valve, union, and dirt leg at connection to each appliance. Lubricate all valves before putting the valves into service.

F. Provide 1/2 inch elastomeric insulation around all piping in walls and through floors.

G. Test all gas piping per NFPA 54.

H. Gas piping shall be accessible.

I. Science room auto shut-off valves can be located in teacher's demo unit, under sink, or exposed in storage room.

END OF SECTION

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