

TECHNICAL GUIDELINES FOR D20 CONSTRUCTION

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Overview

The purpose of this guide is to provide both general and specific direction to contractors, architects, and consultants for the design and construction of all Academy District 20 facility improvements. This document is intended to identify the minimum level of quality of materials and workmanship for products and systems that are most commonly used in District buildings. It is not intended to be all-inclusive. Most projects will not include all of the items specified herein. Most projects will include items not specified herein.

This guide is not intended to limit the use of quality materials, products, or processes nor is it intended to limit creative design or functional and economical solutions; however, any deviations from this guide will require written approval from the District Project Manager. Should any item contained in this guide be contradictory to current building codes and practices, it is the responsibility of the architect, consultant, or contractor to inform the District of such item(s) and provide information on alternatives prior to completion of GMP or contract.

The design professional and/or contractor are responsible for providing a complete design, complete project, and operational systems. These guidelines do not constitute a waiver of responsibility or disclaimer of liability for design negligence or other legal or equitable claims against the District or its employees.

All proposed design solutions and specified materials for District facilities should provide a response to the following needs:

- A. Safety and security for staff, students, and the general public
- B. Reduction of life-cycle costs
- C. Creation of economical design solutions
- D. Ease of maintenance and reduction of maintenance cost
- E. Creation of flexible functional spaces
- F. Reduction of natural resource consumption
- G. Conformance with the spirit and letter of the Americans with Disabilities Act (ADA).

The design professional should carefully analyze all products and construction methods to provide consistent quality and workmanship throughout the entire project.

DEFINITIONS AND RESPONSIBILITY

Academy District 20, or Owner: The terms District 20, District, or Owner shall mean Academy School District 20. The District's responsibility will include overall contract administration for design and construction contracts, participation in plan and specification development, facilitation of internal design and specification reviews, attendance of conferences with regulatory agencies, attendance of scheduled project meetings, provision of all available site and building "as-built" documentation, and stewardship of the project as it relates to the District's school calendar and financial resources. If applicable to the project, the District will furnish the following additional services or information:

- A. Site Survey: Upon receipt of a specific request from the architect, the District will provide a site survey or select and contract directly with a Consultant to provide one.
- B. Soils Test: For new construction or additions, District will provide a soils report or select and contract directly with a Colorado registered geotechnical engineering firm to provide one.
- C. Asbestos Management Plan:
 - 1. Each school has, at the site, an Asbestos Management Plan. The contractor shall be responsible for reviewing this document and becoming familiar with the location of Asbestos Containing Building Materials (ACBM) at the respective facility.
 - 2. All asbestos abatement and/or operations affecting or disturbing known ACBM's shall be performed in accordance with the Asbestos Hazard Emergency Response Act (29 CFR Part 763 – AHERA) and Emissions Standard for Asbestos excerpted from Colorado Regulation Number Eight, "The Control of Hazardous Air Pollutants."
 - 3. Building materials not identified in the Management Plan shall be considered to be an ACBM. Any suspect materials discovered during the contract must be assumed to contain asbestos, and work will be stopped until the material is sampled and analysis completed verifying asbestos content.
 - 4. This sampling shall be coordinated through the District Project Manager. It shall be the responsibility of the contractor to coordinate through the District Project Manager to identify and have any suspect materials tested that may be impacted by their scope of work. A copy of the test results shall be provided to the contractor and District for incorporation into the facilities Management Plan.
- D. Lead-Based Paint: Owner will provide information on lead-based paint and/or provide testing to determine existence of lead-based paint at job site.

It is the responsibility of the primary consultant to distribute this document to all its engineers and subconsultants. All communication between District departments and the design and construction teams will be routed through the District Project Manager to the primary consultant and/or its designee.

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Division 00 – Procurement and Contracting Requirements

004300 PRE-CONSTRUCTION SUBMITTALS SHALL INCLUDE THE FOLLOWING

- A. Certificate of Insurance
- B. Performance Bond when required by Procurement Department
- C. Labor & Material Payment Bond
- D. Schedule of Values
- E. Construction Schedule
- F. List of Material Suppliers and Subcontractors
- G. Material Safety Data Sheets
- H. List of Anticipated Pre-Con Meetings

009000 CHANGES IN THE WORK

- A. The work shall be performed as indicated in this document using the best available products and techniques. Where existing conditions differ from those indicated, the contractor shall submit to the District Project Manager a request for equitable compensation and if found to be in order and fair to all affected parties then it will be approved and a change order will be executed. Change orders shall be submitted on a official form, such as AIA or contractor's standard form. Changes must be approved by District Project Manager prior to execution.

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Division 01 – General Requirements

013300 SUBMITTALS

- A. The following items shall be submitted to the District Project Manager for review prior to ordering or fabrication:
 - 1. List of anticipated submittals to be generated over course of project, to be provided to District no later than ten (10) days prior to work commencing.
 - 2. Samples: any/all items requiring color selection such as; paint colors, carpet, floor tile, wall base, metal roofing, etc.
 - 3. Manufacturer's Data: any/all prefabricated items such as; cabinetry, toilet partitions, toilet accessories, light fixtures & electrical devices, hollow metal doors and frames, wood doors, finish hardware, mechanical equipment, plumbing fixtures, contractor provided equipment, metal roofing, interior finishes, pre-engineered metal buildings, operable walls, etc.
 - 4. Shop Drawings: any/all items requiring shop fabrication, engineering design, or field erection, such as; structural steel, reinforcing steel, concrete mix design, concrete foundation design and installation drawings, hollow metal doors and frames, hardware schedule, pre-engineered metal building design and erection drawings, interior finish schedule, electrical design, electrical fixture schedule, plumbing design, plumbing fixture schedule, HVAC equipment design and installation drawings including complete schedules, operable walls, etc.

013300 SUBSTITUTIONS/ALTERNATES

- A. Items specified herein by manufacturer's name are intended to establish the level of quality and not as a closed specification. Other items of equal or higher quality may be submitted for review to the District as part of each bidder's proposal and, if approved in advance of bid by the District Project Manager, may be substituted for those specified. The term "approved equal" means approved in writing by the owner in advance of purchase and installation.

014000 REGULATORY REQUIREMENTS

- A. Regulatory requirements: All work performed on school district property shall be performed in accordance with the provisions of the Authority Having Jurisdiction (AHJ).
- B. This shall in no way relieve the contractor from providing work and/or procedures in excess of the minimum standards when higher standards are indicated in the drawings and/or the specifications. The contractor shall follow the drawings and/or specifications when/where they indicate work/procedures of higher quality than the minimum code requirements.
- C. In case of a conflict between referenced applicable codes, the one having the more stringent requirements shall govern.
- D. Where drawings or specifications do not comply with the minimum requirements of the codes, the contractor shall be responsible for notifying the District. No action shall

be taken until written approval has been received from the District based on one of the following options:

1. Receive authorization to proceed per drawings and specs
 2. Submit plans for redesign
 3. Install necessary items to meet requirements
- E. The District falls under the jurisdiction of the State of Colorado Division of Fire Prevention and Control, Department of Public Safety. Permits are required by the state for various types of work, as follows:
1. Building permits are required for all new buildings and additions to existing buildings. Building permits are also required for interior alterations conducted within existing buildings that involve structural systems or egress systems. Permits are not required for projects involving only one-for-one replacement of finishes.
 - a. Building permits must be applied for by the contractor and/or designer.
 - b. Reference the State's website for necessary permits.
 2. Electrical permits issued by the State Electrical Board are required for any/all work that requires the installation of new power wiring and for installation of Fire Alarm Systems. One-for-one replacement of existing electrical items in branch circuits only, is exempt from electrical permits. Electrical permits must be applied for and paid for by the electrical contractor.
 3. Plumbing permits issued by the State Plumbing Board are required for any/all work that requires the installation of new piping. Plumbing permits must be applied for and paid for by the plumbing contractor.
 4. Enforcement of the International Fire Code has been delegated to the Colorado Springs Fire Department. However, the State Public Safety Section has retained final authority to make rulings regarding interpretations of the code.
 - a. Permits issued by the fire department are required for installation or modifications to a fire alarm system or fire suppression system.
 - b. Electrical permits issued by the State Electrical Board are required for all fire alarm projects.
 - c. The contractor is responsible for obtaining and paying for all permits on fire alarm projects.
 5. Enforcement of health regulations has been delegated to the Health Department for El Paso County.
 - a. All plans must be submitted to the Health Department and approved prior to commencing work in kitchens, bathrooms, swimming pools, and similar situations involving public health and sanitation.
 - b. It is the responsibility of the plumbing contractor to submit plans, receive approval, and accomplish coordination between the Health Department and the construction project team.
 6. Construction storm water drainage mitigation (erosion control) must be accomplished by the contractor for all site work/earthwork projects which disturb more than one acre of ground. Control measures must comply with the regulations of the City of Colorado Springs. It is the responsibility of the

contractor to apply for, obtain, and pay for any/all construction storm water control permits required by the City of Colorado Springs.

7. Contractors must apply for, obtain and pay for permits from the City of Colorado Springs, Engineering Division for any/all work accomplished within city street rights-of-way.
8. Asbestos abatement permits are required for by the State Health Department for all work that will disturb asbestos containing materials in excess of 160 square feet of flat material or 260 linear feet of pipe insulation. It is the responsibility of the asbestos abatement contractor to apply for, obtain and pay for the asbestos abatement permit.
9. Changes or additions to onsite utility or fiber easements requiring permitting or approval shall be applied for, obtained, and paid by the District.

014100 REGULATORY REQUIREMENTS

- A. The contractor shall have sole responsibility for compliance on the job-site to all applicable portions of the Occupational Safety and Health Act for job-site safety.
 1. Protection of life, health, and public welfare as it relates to the execution of the construction Contract is the responsibility of the contractor. The District will not provide observations, inspection, supervision, or any plans, procedures, or actions employed at the project as they relate to safety of life, health, or public welfare. If conditions are imposed by the District which interfere with or imply actions detrimental to safety, written notice shall be returned to the contractor for action prior to effecting any unsafe conditions.
 2. If the District observes unsafe or dangerous activity on the job-site which violates applicable laws or regulations and affects the safety to workers or the District, it shall provide written notice to the contractor and report the infraction before work commences
- B. The contractor shall have sole responsibility for compliance with the Equal Employment Opportunity Act.

017000 CLOSEOUT FORMS

- A. The last item of work under this contract shall be to submit to the District Project Manager the following items:

Items	Responsible Party
Punchlist complete (no repairs, replacement or other remedies).	By design agent or contractor to PM
Substantial Completion Letter (from PM establishing start of warranty)	By PM to contractor
Certificate of Occupancy and TCO (if applicable).	By contractor to PM
As-built drawings/record drawings: 2 full size sets, 2 half size sets, PDFs (digital file), and CAD of all disciplines (compatible with AutoCAD 2015).	By contractor to PM
As-built Specifications & Project manual –1 hardcopy + PDF	By contractor to PM
Copies of all Finalized Permits (if applicable)	By contractor to PM

Operation & maintenance manuals: 2 hardcopies + 1 digital copy. Include list of principal subcontractors. Tab hardcopy with table of contents. Tab and hyperlink for digital copies.	By contractor to PM
Warranties: 2 hardcopies + 1 digital copy. Include list of warranties that are longer than a year and contractor's written guarantee.	By contractor to PM
Digital copy of all submittals, indicating A/E and District approval, RFIs, ASIs, Change Orders, addenda, and approved shop drawings.	By contractor to PM
Provide training videos, training certificates, and sign-in sheets.	By contractor to PM
Signed asbestos certification letter for newly installed building materials	By contractor to PM
Asbestos or Hazardous Material disposal manifests (if applicable)	By ASTM contractor to PM
Final Inspection Certificates & Testing Reports (if applicable)	By contractor to PM
Building access keys and other security clearances (if applicable)	By contractor to PM
Labeled equipment keys + key locker (if applicable)	By contractor to PM
Attic Stock Transmittals- inventory of all items signed for by the D20 PM	By contractor to PM
License, royalty, or patent clearances (if applicable)	By contractor to PM
Final Pay Application / Invoice (including schedule of values)	By contractor to PM
Tax forms (application for reimbursement of local sales and use taxes, Form ST-16 and ST-16A)	By contractor to PM
Contractor's Release of Liens (or Claims) (AIA Form G706A)	By contractor to PM
All Sub-Contractor's Release of Liens (or Claims)	By contractor to PM
Advertise for Final payment	District
Process final payment after Gazette advertisement	District

017000 CLOSEOUT

A. Drawing Standards:

1. Electronic Media Standards: Plans shall be accessible with specified version of AutoCAD and be saved using settings intended to maximize translation, use and archiving by the District, and utilizing only those programs and elements available in the base line package. All drawing files shall be ".dwg" format and shall include all "x-ref" files and custom fonts used for reproduction. Encrypted data, after market programs, 3D elements, etc. which inhibits the reading or use by the District shall be prohibited.
2. Symbols, Numbering, and Other Identification
 - a. Standard symbols and North arrow shall be used on all plans. Include a standard symbol legend and graphic scale on the first sheet of architectural, structural, mechanical and electrical plans.
 - b. Column lines shall be shown and identified on all plan drawings, including architectural, structural, mechanical and electrical. Attention should be given to the existing room numbering schemes and extension

to the numbering system should be a logical sequence that anticipates future additions.

- c. Room and door numbering systems shall be used and shown on legends.
 - i. All rooms, spaces, and corridors shall be given a number on the drawings.
 - ii. Room numbers must be reviewed and accepted by the District Project Manager prior to publishing final construction documents.

017400 FINAL CLEANUP

- A. After all work is complete, the contractor shall thoroughly clean all affected surfaces, including glass, and leave each site in first class condition. All debris caused by the work shall be removed from the site prior to final payment.

BUILDING SAFETY, SECURITY, MAINTENANCE, AND GENERAL DESIGN GUIDELINES

A. Exterior:

1. Use hard, durable, low-maintenance materials such as brick, block, or concrete panels for exterior walls of buildings. Minimum parapet height should be 14" above finished roof.
2. Utilize security lighting and break-resistant materials in high-risk areas such as building entrances. Security lighting should be of the vandal-proof type. Lighting designs should minimize off-site "light pollution."
3. Exterior stairs to below-grade entrances shall be fully enclosed and have a door at grade level.
4. Provide non-slip easily maintained surfaces on all stairways and ramps.
5. Avoid steps to building entrances. Plan grades surrounding buildings to provide gradual elevation changes and utilize ramps rather than steps when possible.
6. Exterior handrail systems shall be constructed of durable rust-resistant materials (i.e., powdered-coated steel, aluminum, etc.)
7. Make all new buildings or additions fully accessible to the handicapped. Provide ADA door operators at main entrance doors. Door operators shall be interlocked with the building's access control system.
8. Avoid projecting elements on exterior walls that would allow scaling walls for access to roof or that would project into any potential walkways. Instances that constitute building mounted infrastructure shall provide the appropriate deterrent devices to prevent access to the roof or other elevated portions of the facility.
9. All concrete walking surfaces shall be non-slip (broom finish).
10. Consider solar techniques in building orientation and mechanics to reduce energy costs.

11. To reduce vandalism, avoid using windows or window walls in areas that are screened from public streets.
12. Incorporate use of landscaping materials (“activated breeze”) or cobble/rip-rap boulders (5”-12”) and similar materials in landscapes. Organic or rubber based mulches are not allowed.

B. Interior:

1. Masonry or other durable material partitions are desirable in all heavy use areas including gymnasium, cafeterias, all-purpose rooms, corridors, public toilets, and kitchen areas. The use of impact-resistant drywall may be considered for these areas.
2. Use bull-nose masonry for all vertical corners exposed on unit masonry partitions.
3. Provide abrasive nosing on all stairs and non-slip easily maintained surface on all stairs and ramps.
4. Rise and run of stairs shall be properly proportioned and shall meet tolerance requirements of building codes. Stair risers in elementary schools shall not exceed 6-1/2”.
5. Maintain adequate plenum space for proposed mechanical, electrical, plumbing, and fire suppression systems to further include +/- additional 6” of additional clearance beyond these systems for future modifications. .
6. Maintain minimum 9’-0” ceiling height for all areas of all buildings.
7. Provide acoustical separation or sound insulation of some form around music rooms, restrooms, conference rooms, offices, counseling offices, other areas where noise or confidentiality may be of concern.
8. Mechanical access for terminal heating, VAV, and similar space conditioning systems should be located in corridors (not within the classroom or office) whenever possible for access without disrupting the occupied area.
9. Design team shall coordinate with Owner and Owner’s Tele/Data Vendor to provide adequate space for boxes and other data requirements.
10. Provide roof hatch and ladder from inside of building. Roof hatches shall be a minimum of 36” x 48”. Ladder shall be equipped with a retractable safety post.
11. Ease of maintenance and availability of materials should be taken into consideration for all space planning and material selections.

C. Preferred Finishes and Materials (listed in order of preference):

1. Gymnasium, cafeterias, all-purpose rooms, corridors, public toilets, and kitchen areas:
 - a. Concrete block with epoxy or latex enamel finish
 - b. Painted impact-resistant drywall may be considered
2. Classroom Walls:
 - a. Standard painted drywall
 - b. Concrete block w/ latex enamel finish
3. Kitchen Walls:

- a. Fiber Reinforced Panels (FRP) over drywall
- b. Enamel on concrete block
- 4. Restroom Walls:
 - a. Enamel on concrete block
 - b. Fiber Reinforced Panels (FRP) over drywall
- 5. Office Walls:
 - a. Standard painted drywall
 - b. Concrete block w/ latex enamel finish
- 6. Exterior Walls:
 - a. Concrete block integral color, sealed, vandal resistant
 - b. Concrete block painted
 - c. Brick masonry
 - d. Standard two-coat stucco systems may be considered (EIFS not permitted).

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Division 02 – Existing Conditions

GENERAL

- A. All site-work shall conform to the City of Colorado Springs and/ or State of Colorado, unless indicated otherwise.

024100 DEMOLITION

- A. Items to be removed and retained by the District 20 will be removed by the District 20 in advance of the project unless noted otherwise.
- B. Other items indicated in this document to be removed, shall be removed by the contractor and transported from the site, retained for reinstallation or retained for District 20's first right of refusal, as indicated in the Final Construction Documents.
- C. Protection: Erect weatherproof enclosures over new exterior openings in existing building to protect building interior until new finish materials are installed.
- D. Shoring and Bracing: Provide necessary temporary shoring and bracing to support and protect portions of existing building during demolition operations. Such shoring shall be left in place until permanent supports have been installed. The contractor shall be solely responsible for the design, safety, and adequacy of temporary shoring and bracing and its ability to carry the load for which intended.
- E. Cutting shall be done with extreme care so as not to damage adjacent surfaces to remain.
- F. All surfaces which are damaged as part of demolition procedures or which are necessarily cut for demolition shall be patched, repaired and painted to match existing finishes.
- G. If exterior brick becomes part of an interior wall in a remodel, it shall be cleaned of dirt and debris prior to being enclosed with new construction.
- H. The contractor shall at all times during the demolition keep the premises free from accumulations of waste material or rubbish caused by his employees or work. At the completion of the work, contractor shall remove rubbish, tools, and surplus materials. Leave the premises clean and ready for subsequent work.
- I. Wet down work during demolition operations to prevent dust from arising.
- J. It is the responsibility of the consultants and contractors to verify field conditions prior to commencement of work.
- K. Asbestos, Lead Base Paint, and Other Hazardous Materials. Review the Hazardous Materials Management Plan at each District facility. These documents indicate "known" conditions although it is always possible that unknown conditions may exist. Designers and contractors shall be responsible for reviewing the documents and becoming familiar with the location of known hazardous materials at each District facility prior to beginning work. All asbestos abatement and/or operations affecting asbestos containing materials shall be performed in accordance with the Asbestos Hazard Emergency Response Act (29 CFR Part 763 – AHERA) and Emissions Standard for Asbestos excerpted from Colorado regulation number eight, "The Control of Hazardous Pollutants." Although asbestos may be present in many different building materials

used for prior construction, contractors and designers should be aware that asbestos has typically been found in the following building materials:

1. Mechanical Fittings and insulation.
 2. Electrical wiring and insulation.
 3. General building insulation.
 4. Transite panels.
 5. Floor tiles & floor tile adhesive.
 6. Ceiling tiles and ceiling tile adhesive.
 7. Gypsum board partitions.
 8. Sink coatings.
- L. Contractors performing demolition or cutting and patching work in areas where lead-based paint is present are required to be certified renovators in lead-safe work practices and must follow all governmental regulations regarding removal and disposal of materials containing lead-based paint.
- M. Refrigerant Recovery Technician Qualifications: Certified by an EPA approved certification program.
- N. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

CUTTING & PATCHING

- A. Cutting: Removal of existing construction necessary to permit installation or performance of other Work.
- B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.
- C. All concrete required to be removed shall first be saw cut to present a clean and neat edge.
- D. Masonry units which are to be removed shall be chiseled at the mortar joints and the mortar shall be removed to facilitate reinstallation and toothing of the new masonry.

FINISHED GRADING

- A. Grades shall be finished to remove all rocks, clods, debris, etc., and ready for soil preparation appropriate for the planned surface material.
- B. Finished grades shall be sloped away from building and auxiliary structures at a minimum slope of 2%.
- C. Where planned surface material is cobble/ rip-rap, finish grading shall be complete so that no additional surface preparation is necessary. Surface shall have a single layer of Mirafi Series 1100 installed prior to surface material being installed.
- D. Minimum of 4" of premium topsoil shall be installed in areas that will be sodded or seeded.

EXCAVATION, BACKFILL AND COMPACTION

- A. Before starting excavating activities, it is the contractor's responsibility to obtain all public and private locates. Failure to do so will result in the contractor taking full responsibility for all utilities that are damaged.

- B. Before starting excavating work, coordinate with District 20's Site Representative and furnish schedule of operations to District 20. Provide and maintain temporary bridges, walks and bridges over excavations where underground utility lines, sewers, water lines, etc., cross access roads, walks, and streets. Make necessary arrangement with authorities having jurisdiction.
- C. Do not interrupt utilities serving facilities unless permitted in writing by District 20's representative. Do not proceed with utility interruptions without written permission. Notify District 20's representative not less than two days in advance of proposed utility interruptions.
- D. Avoid cutting or injuring trees and vegetation outside project limit line and/or outside areas to be cleared as indicated, without District 20's permission. Protect existing trees from damage. The contractor shall accept responsibility for damages outside these lines.
- E. Provide pumps, hoses, pipe, labor and fuel, necessary to keep excavations free of water accumulation. Maintain and operate equipment in a professional manner. Discharge water in manner not interfering with and not to undermine or disturb existing or adjacent structures or land. Grade to prevent surface water from flowing into all excavations and trenches. Do not discharge dirt, backfill, debris, into sanitary or storm drainage systems.
- F. If subgrade soils are disturbed or become unstable due to dewatering operation or an inadequate dewatering system, notify engineer and District 20's Representative, stabilize the subgrade and modify system to perform as specified at no additional cost.
- G. Wet down work during demolition operations to prevent dust from arising.
- H. All exterior holes, voids, footing trenches, etc., in soil created as a part of construction shall be back-filled with structurally sound material free of frost, organic material, debris, or other material which may reduce the structural integrity of subsoil, in lift depth approved by geotechnical engineer, and compacted to equal that indicated in the soils investigation report developed by a consultant under contract to the District 20, where such exists.
- I. Where a soils report does not exist, compact soil to 90% maximum modified proctor density in accordance with ASTM D 1557.

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Division 03 – Concrete

033000 CAST-IN-PLACE CONCRETE

GENERAL

- A. Concrete shall be furnished and installed based on latest editions and applicable portions of ACI, CRSI, ASTM standards and City of Colorado Springs Engineering Standards.
- B. Specification description of methods and materials shall clearly outline all requirements of the work.
- C. ACI and ASTM Standard numbers should be used as reference only to expand or substantiate the basic information shown in the specification.
- D. Shop drawings for reinforcement, mix designs, and pre-stressed units shall be required.
- E. Contractors shall meet City of Colorado Springs specifications for handicap ramps or any other concrete work that is in the City right of way (ROW).
- F. Rebar, welded-wire-fabric and anchors shall be manufactured in the USA.
- G. All exposed rebar, grade stakes and form-spikes shall have protective end caps installed at all times.
- H. Applicable permits shall be obtained prior to working in City of Colorado Springs Right of Way or Easements.
- I. Contractor shall obtain public and private utility locates prior to commencement of work.

PRODUCTS

- A. List all materials. Call for concrete in conformance with ASTM C-94, latest edition. Air entrainment is required for all exterior concrete. Calcium chloride admixtures are prohibited.
- B. It is the responsibility of the contractor to return any landscaping disturbed to its original condition. This shall include, but isn't limited to: Irrigation equipment, weed barriers, plantings, landscaping media, etc.
- C. No site mixed concrete will be allowed.
- D. Concrete for general use shall have a minimum compressive strength of 4000 psi (City 4000 Mix) at 28 days with slump not to exceed 4".
- E. Specified design mixes required by the consultant shall be clearly indicated as such in the Contract Documents and Specifications.
- F. Specified design mixes shall be submitted to and approved in writing by architect and/or District Project Manager prior to placement of any concrete. The contractor shall furnish evidence satisfactory to District 20 and architect that all materials to be used and proportions selected will conclusively and uniformly produce concrete of the quality specified. Mix designations of approved mix design shall appear on all truck

delivery tickets. A copy of all batch tickets shall be given to the District Project Manager.

- G. The use of jitterbugs during placement is prohibited.
- H. All interior concrete to have smooth trowel finish.
- I. Specify floor surface finishes and the procedure for obtaining them. Typical floors shall be finished level, except where drains occur, in which case they shall be sloped to drains.
- J. Floors in new facilities shall have flatness and levelness testing conducted and referenced against industry standards for acceptance. Provide documentation to the District.
- K. All exterior concrete to have light broom finish.
- L. Installation of concrete over expansive soils will require the excavation of additional material until all expansive soil has been removed and bearing area has been stabilized. The use of geogrid stabilization mats such as TriAx or BX-1200 may be required to stabilize bearing area. Acceptable fill materials depending on application are class 6 road base, or recycled concrete.
- M. Specify size of aggregate, minimum and maximum slump for each class of concrete, air content percentages, and minimum strength at 28 days.
- N. Specify placement procedures. List hot and cold weather requirements for placement of concrete, and protection and curing standards.
- O. Specify and show type, size, and location of all control joints and expansion joints.
- P. Compatible sealers and curing compounds shall be specified for specific floor finishes (i.e. epoxy, VCT, carpet, etc.).
- Q. Concrete Testing – Unless otherwise noted, testing agency shall be designated, secured, and services paid for by the District 20. Testing will be done per specified procedures. architect will consult with District 20 if additional testing is needed. architect will consult with District 20 regarding the number of tests, number of cylinders, etc. Averaging of separate tests to determine strength is not permitted. The contractor will contact testing agency to schedule specified testing.
- R. Copies of the test reports will be forwarded from the testing agency to the District 20, architect, and contractor.
- S. Concrete which fails to meet the specified strength requirements and which, in the architect's opinion, cannot be brought into conformance, will be rejected and shall be removed and replaced at the contractor's expense.
- T. Acceptance criteria for formed surfaces shall be specified.

FORM-FACING MATERIALS

- A. Specify design for lateral pressure and loads in accordance with ACI and wind loads as per applicable sections of the controlling local building code.
- B. Specify tolerances for formed surfaces.

- C. Specify applicable materials for concrete finish desired.
- D. Chamfer exterior corners of concrete surfaces.

REINFORCEMENT ACCESSORIES

- A. List materials and give specific ACI and ASTM specification designations.
- B. Specify placement methods and reinforcement quantity.
- C. Specify size of anchor bolts and placement requirements.
- D. Specify rebar anchorage between foundation walls and exterior platform at exterior doors to limit frost heave.
- E. Sidewalks shall contain Welded-Wire-Fabric (WWF) with a minimum size of 4x4-6. Provide chairs or other device to maintain center location of WWF.

EXECUTION

EXPANSION JOINT

- A. Expansion joint material shall be provided at the following locations and shall be in place prior to the placement of concrete:
 - 1. At each end of curb return.
 - 2. At both edges of driveway.
 - 3. Between back of sidewalk and driveway slab or service walk.
 - 4. Between new concrete and existing masonry buildings.
 - 5. As shown on the Contract Documents.
 - 6. As directed by the District Project Manager or appointed representative.
 - 7. Between new and existing concrete.
 - 8. Every 100 feet in sidewalk curb and gutter when hand formed.
 - 9. Every 200 feet in sidewalk, curb and gutter when place slip formed.
 - 10. At or around inlets.
 - 11. Place controlled joints in grade-supported slabs in accordance with ACI guidelines.

CONTRACTION JOINTS

- A. Transverse joints shall be placed at maximum intervals of 10 feet to control random cracking; joints shall be formed, sawed, or tooled to a minimum depth of $\frac{1}{4}$ of the total thickness. If divider plates are used, the maximum depth of plates shall not be greater than $\frac{1}{2}$ depth at the finished surface and shall be no less than one (1") inch.

TOOL JOINTS

- A. Tool joints shall be spaced as follows:

1. Not more than ten 10 feet nor less than five (5') feet apart in curb and gutter and combination curb-sidewalk.
2. Not more than the width of the sidewalk (up to eight (8') feet), nor less than five (5') feet apart in sidewalk.
3. At least two (2) joints, equally spaced at not greater than 10-foot intervals applicable in driveways.
4. As directed by the District Project Manager or appointed representative.

PROTECTION

A. Cold Weather Concreting:

1. During extreme weather conditions, placing of concrete shall be permitted only when the temperature of the concrete placed in the forms is not less than 60 degrees Fahrenheit nor more than 90 degrees Fahrenheit. To maintain this temperature range, the contractor shall provide acceptable heating apparatus for heating the aggregates and the water.
 - a. Concrete may be placed when the air temperature in the shade is 40 degrees Fahrenheit and rising.
 - b. No concrete shall be placed, regardless of the present temperature, when the weather forecast promises freezing weather before final set of the concrete unless special means of heating and protection are used.
 - c. Protection against freezing is the contractor's responsibility regardless of the weather forecast or climatic conditions at the time of placing.
 - d. Small structures and slabs may be protected by completely covering fresh concrete with plastic sheeting or insulating blankets to a thickness that insures protection. Material shall be secured to prevent displacement by the elements. Large structures or vertical walls shall be protected against freezing by enclosing the structure and heating with salamanders, heaters, or other devices capable of providing uniform and even heat throughout the structure.
 - e. Concrete placed in cold weather shall be protected from extreme temperatures as follows:
 - i. A temperature of at least 50 degrees Fahrenheit for the first 72 hours shall be maintained. b. After the first 72 hours and until the concrete is seven (7) days old, it shall be protected from freezing temperatures.
 - ii. Concrete adjacent to heaters or salamanders shall be insulated from direct heat of the unit, which may dry it out prior to being properly cured.
 - iii. Temperatures shall be measured by maximum and minimum thermometers furnished by the contractor and installed adjacent to the concrete.

- f. Concrete slabs shall not be placed regardless of temperature conditions if the supporting ground is frozen or contains pockets of frost. Use of salt or other additives to prevent concrete from freezing shall not be allowed. Concrete which has been frozen shall be completely removed and replaced as directed by, and to the satisfaction of, the District Project Manager or appointed representative.

B. Hot Weather Concreting:

1. Except by written authorization, concrete shall not be placed if the temperature of the plastic concrete cannot be maintained at 90 degrees Fahrenheit or lower. The placement of concrete in hot weather shall comply with ACI 305 and City of Colorado Springs Engineering Standards & Specifications (latest version).

033543.01 POLISHED CONCRETE FINISHING

GENERAL

- A. Minimum of 400 grit finish:
 1. Level 2.
 2. Gloss Reading: 40–50.
 3. Class B Aggregate Exposure.
- B. Colors – dark colors preferred, but no standard.
- C. All water used in grinding process needs to be taken offsite; NO water from the process shall be discharged down the facilities drain.

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Division 04 – Masonry

042000 UNIT MASONRY

GENERAL

SUMMARY

- A. Masonry and associated items shall be prepared and installed in accordance with the recommendations of the Colorado Masonry Institute and the following:
 - 1. ASTM-C90: Lightweight Hollow Load Bearing Concrete Masonry Units Grade A.
 - 2. ASTM-C216: Building Brick, grade SW, 3,000 psi.
 - 3. ASTM-C150: Portland Cement for Mortar, Type II.
 - 4. ASTM-C270: Mortar Procedures.
 - 5. ASTM-C207: Lime, Type S.
 - 6. ASTM-A82: Welded Wire Fabric.
 - 7. ASTM-A615: Reinforcing Bars, Grade 60.
- B. Mortar shall have a minimum compressive strength of 1,800 psi at 28 days.
- C. Grout shall have a minimum compressive strength of 2,500 psi at 28 days.
- D. Exterior veneers shall be of locally sourced materials.
- E. Exterior veneers shall have anti-graffiti coatings applied as applicable.

ADMINISTRATIVE REQUIREMENTS

- A. Preconstruction Meeting: Convene meeting one week before starting work of this Section.
- A. Require attendance by all relevant installers.
- B. Require attendance of parties directly affecting work of this Section.
- C. Review conditions of installation, installation procedures, and coordination with related work.

SUBMITTALS

- A. Product Data: Provide data for masonry units, mortar, and masonry accessories.
- B. Include product data for integral water repellent admixture, indicating compliance with specified performance requirements.
- C. Samples: Submit four samples of decorative block units to illustrate color, texture, and extremes of color range.
- D. Samples for each bond beam shape forming the bottom of reinforced masonry lintels. The exposed bottom surface of solid bottom bond beam block is to be free from cracks

and other surface defects (crazing) and the texture is to be similar to the side surface texture.

- E. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.

QUALITY ASSURANCE

- A. Comply with provisions of ACI 530/530.1/ERTA, except where exceeded by requirements of the Contract Documents.
- B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum three years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.
- D. Acceptable installers: RMMI Certified Masonry Professionals (CMP), Contractors (CMC), and Specialists (CMS) are mandatory.

MOCK-UP

- A. Mock-up: Construct masonry veneer as part of exterior wall mock-up, as indicated on Drawings; include mortar, accessories, structural backup, wall openings, flashings (with lap joint, corner, and end dam), and wall insulation with integrated weather barrier system in mock-up.
- B. Locate where directed.

PRODUCTS

- A. Products shall be provided as called for in the Contract Documents and Specifications, such as:
 - 1. Concrete Masonry Units (CMU).
 - 2. Mortar Materials.
 - 3. Reinforcement and Anchorage.
 - 4. Flashing.
 - 5. Control Joints.
 - 6. Joint Filler.
 - 7. Cavity Mortar Control.
 - 8. Insulation Inserts.
 - 9. Weather Barrier.
 - 10. Termination Bars.
 - 11. Lap Sealants.
 - 12. Lap Tape.

13. Weeps.
14. Cavity Vents.
15. Drainage Fabric.
16. Sealants.
17. Clean Solution.
18. Sealing Solution.
19. Lintels.

EXECUTION

EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other Sections are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.
- D. Verify weather barrier is installed according to Contract Documents, Contract Specifications and manufacturers recommendations.
- E. Verify integral continuous insulation/weather barrier is installed according to Contract Documents, Contract Specifications and manufacturers recommendations.

PREPARATION

- A. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

COLD AND HOT WEATHER REQUIREMENTS

- A. Comply with requirements of ACI 530/530.1/ERTA, BIA, NCMA, or applicable building code, whichever is more stringent.

COURSING

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Concrete Masonry Units:
 1. Bond: Running.
 2. Coursing: One unit and one mortar joint to equal 8 inches.
 3. Mortar Joints: Concave.

PLACING AND BONDING

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

- B. Lay hollow masonry units with face shell bedding on head and bed joints.
- C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- D. Remove excess mortar and mortar smears as work progresses.
- E. Remove excess mortar with water repellent admixture promptly. Do not use acids, sandblasting or high-pressure cleaning methods.
- F. Interlock intersections and external corners.
- G. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- H. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- I. Cut mortar joints flush where wall tile is scheduled or resilient base is scheduled.
- J. Isolate masonry partitions from vertical structural framing members with a control joint.
- K. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.
- L. Interior masonry, outside corners of walls shall be bullnose.

WEEPS/CAVITY VENTS

- A. Install weeps in veneer walls at maximum 24 inches on center horizontally above through-wall flashing, above shelf angles and lintels, at bottom of walls, and rowlock/belt courses where indicated, and 24 inches above grade at north and lee sides of building (to accommodate snowdrifts).
- B. Install cavity vents in veneer walls at maximum 32 inches on center horizontally below shelf angles and lintels, near top of walls, and maximum 10 feet on center vertically (or centerline of wall 11 feet to 20 feet tall).

CAVITY MORTAR CONTROL

- A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.
- B. For cavity walls, build inner wythe ahead of outer wythe to accommodate accessories.

REINFORCEMENT AND ANCHORAGE - SINGLE WYTHER MASONRY

- A. Refer to structural engineer requirements. Minimum requirements listed below:
- B. Install horizontal joint reinforcement at minimum 8 inches on center.
- C. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- D. Place continuous joint reinforcement in first and second joint below top of walls.
- E. Lap joint reinforcement ends minimum 12 inches.

REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

- A. Install horizontal joint reinforcement 16 inches on center.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- C. Place continuous joint reinforcement in first and second joint below top of walls.
- D. Lap joint reinforcement ends minimum 6 inches.
- E. Stud Back-Up: Secure veneer anchors to stud framed back-up and embed into masonry veneer at maximum 1.77 sq. ft of wall surface per anchor. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.

REINFORCEMENT AND ANCHORAGES - CAVITY WALL MASONRY

- A. Install horizontal joint reinforcement 16 inches on center. Ladder or truss type as directed by structural engineer.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of openings.
- C. Place continuous joint reinforcement in first and second joint below top of walls.
- D. Lap joint reinforcement ends minimum 6 inches.
- E. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Space anchors at maximum of 24 inches horizontally and 16 inches vertically.

MASONRY FLASHINGS

- A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
- B. Extend flashings full width at such interruptions and at least 6 inches into adjacent masonry or turn up at least 8 inches to form watertight pan at non-masonry construction.
- C. Remove or cover protrusions or sharp edges that could puncture flashings.
- D. Seal lapped ends and penetrations of flashing before covering with mortar.
- E. Install manufactured through-wall flashings in conjunction with manufacturer's required accessories, including web spacer/bridge units, drainage mattes, and similar items to produce a complete, properly functioning installation.
- F. Extend metal flashings to within 1/4 inch of exterior face of masonry.
- G. Lap end joints of flashings at least 6 inches and seal watertight with flashing sealant adhesive.

LINTELS

- A. Install loose steel lintels over openings as indicated on Contract Documents.
- B. Maintain minimum 6-inch bearing on each side of opening.

CONTROL AND EXPANSION JOINTS

- A. Locate control joints as shown on Drawings and per BIA and NCMA guidelines.
- B. Size control joints as indicated on Drawings; if not shown, 3/8 inch wide.
- C. Provide sealed expansion joint at all internal corners, whether specifically noted or detailed.
- D. Do not continue horizontal joint reinforcement through control or expansion joints.
- E. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

BUILT-IN WORK

- A. As work progresses, install built-in metal door frames and other items to be built into the work and furnished under other Sections.
- B. Install built-in items plumb, level, and true to line.
- C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.
- D. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.
- E. Do not build into masonry construction organic materials that are subject to deterioration.

TOLERANCES

- A. Maximum Variation from Alignment of Columns: 1/4 inch.
- B. Maximum Variation from Unit to Adjacent Unit: 1/16 inch.
- C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.
- D. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
- E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.
- F. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.
- G. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

CUTTING AND FITTING

- A. Cut and fit for chases. Coordinate with other sections of work to provide correct size, shape, and location.
- B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests.

CLEANING

- A.* Remove excess mortar and mortar droppings.
- B.* Replace defective mortar. Match adjacent work.
- C.* Clean new masonry per BIA and NCMA recommendations one week minimum, 2 weeks maximum, after placement.
- D.* Use non-metallic tools and stiff brushes in cleaning operations.

PROTECTION

- A.* Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.
- B.* Install required protection of installed work at the end of each workday.

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Division 05 – Metals

EXTERIOR STEEL STAIRS

- A. Exterior steel stairs to be welded stair treads w/ rectangular bars, 19-w-4 spacing, galvanized steel, hot dipped, 1 ¼" x 3/16: rectangular bars, serrated surface, checkered plate 90 deg. Angle nosing, 77% open area.

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Division 06 – Wood, Plastics, and Composites

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Division 07 – Thermal and Moisture Protection

071200 BUILT-UP BITUMINOUS DAMPPROOFING

GENERAL

- A. Product Data: Provide properties of primer, bitumen, and mastics.
- B. Weather Limitations:
 - 1. Proceed with application only when existing and forecasted weather conditions permit dampproofing to be performed according to manufacturers' written instructions.
 - 2. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application until dampproofing has cured.
- C. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has cured.
- D. Installer Qualifications: Company specializing in performing the work of this Section with minimum five years' experience.
- E. Contractor shall maintain weather log for days and conditions when dampproofing is installed.

PRODUCTS

- A. Source Limitations: Obtain primary dampproofing materials and primers from single source from single manufacturer.
- B. VOC Content: Products shall comply with VOC content limits of authorities having jurisdiction unless otherwise required.
- C. Bituminous Dampproofing: Cold-applied, emulsified-asphalt spray-grade; asphalt base, volatile petroleum solvents, and other content, suitable for application by spray, brush, roller, or squeegee; asbestos-free; suitable for application on vertical and horizontal surfaces.
 - 1. Composition: ASTM D 1227, Type III, Class 1, asbestos free.
 - 2. Applied Thickness: 1/16-inch, minimum, wet film.
 - 3. Low-Emitting Materials: Dampproofing shall comply with 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."
- D. Primers, Mastics, and Related Materials: Materials shall be submitted in writing by dampproofing manufacturer for intended use and compatible with bituminous dampproofing.
 - 1. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended in writing by manufacturer.
 - 2. Primer shall comply with 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."

EXECUTION**DAMPPROOFING**

- A. Examine substrates, areas, and conditions with Applicator present, for compliance with requirements for surface smoothness, surface moisture, and other conditions affecting performance of bituminous dampproofing work.
- B. Proceed with application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.
- C. Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.
- D. Clean substrates of projections and substances detrimental to the dampproofing work; fill voids, seal joints, and remove bond breakers if any, as recommended in writing by prime material manufacturer.
- E. Comply with manufacturer's written instructions for:
 - 1. Allowable application temperature.
 - 2. Dampproofing application, cure time between coats, and drying time before backfilling unless more stringent requirements are indicated.
 - 3. Additional coats if recommended in writing by manufacturer or to achieve a smooth surface and uninterrupted coverage.
- F. Where dampproofing footings and foundation walls:
 - 1. Apply from finished-grade line to top of footing.
 - 2. Extend over top of footing and down to the base of the footing.
 - 3. Extend dampproofing 12 inches onto intersecting walls and footings, but do not extend onto surfaces exposed to view when project is completed.
- G. Where dampproofing interior face of above-grade, exterior walls, continue dampproofing through intersecting walls by keeping vertical mortar joints at intersection temporarily open or by dampproofing wall before constructing intersecting walls.
- H. Concrete Foundations: Apply two brush or spray coats at not less than 1.5 gal./100 sq. ft. for first coat and 1 gal./100 sq. ft. for second coat.
- I. Items that project through dampproofing surface should be sealed watertight with dampproofing.
 - 1. Where indicated, install protection course over completed-and-cured dampproofing. Comply with dampproofing-material and protection-course manufacturers' written instructions for attaching protection course.
 - 2. Support protection course over cured coating with spot application of adhesive type recommended in writing by protection-board manufacturer.
- J. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

071300 SHEET WATERPROOFING

GENERAL

- A. Coordinate with concrete installer for surface preparation required prior to installation of waterproofing system at indicated locations.
- B. Provide data for membrane and manufacturer's installation instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing: Indicate special procedures.
- C. Perform Work in accordance with NRCA Roofing and Waterproofing Manual for specified waterproofing system.
- D. Membrane Manufacturer Qualifications: Company specializing in waterproofing sheet membranes with three years' experience.
- E. Installer Qualifications: Company specializing in performing the work of this Section with minimum five years' experience and approved, licensed or acceptable to waterproofing manufacturer for installation of waterproofing required for this project.
- F. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application, unless otherwise allowed by manufacturer's requirements, and until liquid or mastic accessories have cured.
- G. Correct defective Work within a one-year period after Date of Substantial Completion; remove and replace materials concealing waterproofing at no extra cost to District 20.
- H. Product shall have a minimum of a 10-year manufacturer's warranty.

PRODUCTS

- A. Self-Adhered Modified Bituminous Membrane:
 - 1. Thickness: 60 mil (0.060 inch).
 - 2. Elongation at Break: 300 percent, minimum, measured according to ASTM D412.
 - 3. Peel Strength: 7 pounds per inch, minimum, when tested according to ASTM D903.
 - 4. Lap Adhesion Strength: 4 pounds per inch, minimum, when tested according to ASTM D1876.
 - 5. Puncture Resistance: 50 pounds, minimum, measured in accordance with ASTM E154/E154M.
 - 6. Adhesives, Sealants, Tapes, Drainage Board and Accessories: As recommended by membrane manufacturer.
- A. EPDM Rubber Membrane: Ethylene-propylene-diene terpolymer rubber sheet complying with ASTM D4637/D4637M, Type II internally reinforced and with soil burial resistance requirement of ASTM D6134.
 - 1. Thickness: 0.060-inch, minimum.
 - 2. Sheet Width: As large as is practical, with factory vulcanized splices.
 - 3. Field Seaming: Contact cement and lap edge sealant.
 - 4. Ultimate Elongation: 300 percent, minimum, measured in accordance with ASTM D412.

5. Puncture Resistance: Withstanding 55 pounds-force, minimum, when tested in accordance with ASTM D5602/D5602M.
6. Adhesives, Sealants, Tapes, and Accessories: As recommended by membrane manufacturer.
7. Flashing: Cured EPDM rubber sheet.
8. Seaming Materials: As recommended by membrane manufacturer.
9. Membrane Sealant: As recommended by membrane manufacturer.
10. Termination Bars: Aluminum; compatible with membrane and adhesives.
11. Adhesives: As recommended by membrane manufacturer.
12. Thinner and Cleaner: As recommended by adhesive manufacturer, compatible with sheet membrane.
13. Sealant for Cracks and Joints in Substrates: Resilient elastomeric joint sealant compatible with substrates and waterproofing materials.
14. Protection Board: Type capable of preventing damage to waterproofing due to backfilling and construction traffic.
 - a. Use one of the following:
 - i. Hardboard, 1/4 inch thick.
 - ii. Asphalt impregnated wood fiberboard, 1/4 inch thick.
 - iii. Polystyrene foam board, 1-inch thick.
15. Flexible Flashings: Type recommended by membrane manufacturer.

EXECUTION

- A. Verify substrate surfaces are durable, free of matter detrimental to adhesion or application of waterproofing system.
- B. Verify that items that penetrate surfaces to receive waterproofing are securely installed.
- C. Protect adjacent surfaces not designated to receive waterproofing.
- D. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions.
- E. Do not apply waterproofing to surfaces unacceptable to membrane manufacturer.
- F. Seal moving cracks with sealant, not rigid filler, using procedures recommended by sealant and waterproofing manufacturers.
- G. Concrete Surfaces for Adhesive Bonding: Prepare concrete substrate according to ASTM D5295/D5295M.
 1. Remove substances that inhibit adhesion including form release agents, curing compounds admixtures, laitance, moisture, dust, dirt, grease and oil.
 2. Repair surface defects including honeycombs, fins, tie holes, bug holes, sharp offsets, rutted cracks, ragged corners, deviations in surface plane, spalling and delamination, as described in the reference standard.
 3. Remove and replace areas of defective concrete as specified in the Contract Documents and Specifications.

4. Prepare concrete for adhesive bonded waterproofing using mechanical or chemical methods described in the referenced standard.
5. Test concrete surfaces as described in the referenced standards. verify surfaces are ready to receive adhesive bonded waterproofing membrane system.
6. Protect waterproofing assembly until backfill operations are completed.
7. Do not permit traffic over unprotected or uncovered membrane.

MEMBRANE

- A. Install membrane waterproofing in accordance with manufacturer's instructions.
- B. Roll out membrane. Minimize wrinkles and bubbles.
- C. Self-Adhering Membrane: Remove release paper layer. Roll out on substrate with a mechanical roller to encourage full contact bond.
- D. Adhesive Bonded Membrane: Apply adhesive in accordance with manufacturer's instructions. Bond sheet to substrate except those areas directly over or within 3 inches of a control or expansion joint.
- E. Overlap edges and ends and seal by method recommended by manufacturer, minimum 3 inches. Seal permanently waterproof. Apply uniform bead of sealant to joint edge.
- F. Reinforce membrane with multiple thickness of membrane material over joints, whether joints are static or dynamic.
- G. Weather lap joints on sloped substrate in direction of drainage. Seal joints and seams.
- H. Install flexible flashings. Seal items penetrating through membrane with flexible flashings. Seal watertight to membrane.
- I. Seal membrane and flashings to adjoining surfaces. Install termination bar at all edges. Install counterflashing over all exposed edges.

PROTECTION BOARD

- A. Place protection board directly against drainage panel; butt joints. Scribe and cut boards around projections, penetrations, and interruptions.

071900 WATER REPELLENTS

GENERAL

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this Section with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this Section with minimum of three years' experience.
- C. Mock-up: Prepare a representative surface 36 by 36 inch in size using specified materials and preparation and application methods on surfaces identical to those to be coated; approved mock-up constitutes standard for workmanship.
 1. Locate where directed.
- D. Do not apply coatings, except with the written recommendation of the manufacturer, when the substrate surfaces have cured for less than a period of 60 days; when rain or temperatures below 50 degrees F are predicted for a period of 24 hours; earlier than 3 days after the surfaces became wet from rainfall or other moisture sources; when the substrate is frozen; or on substrate temperature of less than 40 degrees F.

- E. Do not apply coatings when wind velocity is higher than 20 mph.

PRODUCTS

- A. Exterior and Interior Graffiti Coating: Two-component, solvent-based aliphatic urethane coating system; non-glossy, colorless, water-vapor-permeable, non-yellowing sealer, that dries invisibly leaving appearance of substrate unchanged.
1. Number of Coats: Two.
 2. VOC Content: Less than 600 g/L, when tested in accordance with ASTM D3690 or D5095.
 3. Moisture Absorption When Applied to Masonry: 5 percent, maximum, when tested in accordance with ASTM C140 using masonry sample completely coated.
 4. Height: 10'-0" above grade or floor surface.
 5. Acceptable Product: PROSoCo, Inc.; Weather Seal Blok-Guard & Graffiti Control.

EXECUTION

- A. Verify joint sealants are installed and cured.
- B. Verify surfaces to be coated are dry, clean, and free of efflorescence, oil, or other matter detrimental to application.
- C. Protection of Adjacent Work:
1. Protect adjacent landscaping, property, and vehicles from drips and overspray.
 2. Protect adjacent surfaces not intended to receive coatings.
- D. Prepare surfaces to be coated as recommended by coating manufacturer for best results.
- E. Do not start work until masonry mortar substrate is cured a minimum of 60 days.
- F. Remove loose particles and foreign matter.
- G. Remove oil and foreign substances with a chemical solvent that will not affect coatings.
- H. Scrub and rinse surfaces with water and let dry.
- I. Allow surfaces to dry completely to degree recommended by coating manufacturer before starting coating work.
- J. Apply in accordance with coating manufacturer's instructions, using procedures and application methods recommended as producing the best results.
- K. Apply at rate recommended by coating manufacturer, continuously over entire surface.
- L. Apply two coats, minimum.
- M. Comply with coating manufacturer's instructions for limitations on drying time between coats, and for drying times after rainstorm wetting of surfaces between coats. Consult manufacturer's technical representative if recommendations are not applicable to project conditions.
- N. Delay application of coating until installation of sealants has been completed in joints adjoining surfaces to be coated.

- O. Remove coating from unintended surfaces immediately by a method instructed by coating manufacturer.

072100 THERMAL INSULATION

GENERAL

- A. Insulation values shall meet or exceed the requirements as listed in the International Energy Conservation Code (IECC).
- B. The type of insulation and the placement of said insulation shall be determined by a licensed / registered design professional.
- C. The use of ultra-low VOC spray-applied insulation, open or closed cell, is encourage in new construction.
- D. Batt and blanket insulation shall be mineral wool. Shall comply with ASTM C 665 and ASTM E136, type 1, consisting of fibers with a smoke development index of 25 and flame-spread index of 50, passing ASTM E136 for combustion characteristics.
- E. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- F. Protect foam-plastic board insulation as follows:
 - 1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
 - 2. Always protect against ignition. Do not deliver foam-plastic board materials to Project site until just before installation time.
 - 3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.
- G. Apply insulation to substrates by method indicated, complying with manufacturer's written instructions. Seal joints between insulation units.

PRODUCTS

EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD

- A. Extruded polystyrene boards in this article are also called "XPS boards." Roman numeral designators in ASTM C 578 are assigned in a fixed random sequence, and their numeric order does not reflect increasing strength or other characteristics.
- B. Extruded Polystyrene Board, Type IV: ASTM C 578, Type IV, 25-psi minimum compressive strength; unfaced; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Owens Corning Foamular 250 XPS or comparable product by one of the following:
 - a. Dow Chemical Company (The).
 - b. Owens Corning.
 - 2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

- B. Extruded Polystyrene Board, Type IV, Drainage Panels (Foundation Insulation): ASTM C 578, Type IV, 25-psi minimum compressive strength; faced with filtration fabric; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84; fabricated with shiplap or channel edges and with one side having grooved drainage channels.
- C. Basis-of-Design Product: Subject to compliance with requirements, provide Owens Corning Foamular Insul-Drain or comparable product by one of the following:
 - 1. Dow Chemical Company (The).
 - 2. Owens Corning.

MINERAL-WOOL BLANKETS

- A. Mineral-Wool Blanket, Unfaced: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Roxul Inc.
 - 2. Thermafiber Inc.; an Owens Corning company.

CLOSED-CELL: ULTRA LOW VOC SPRAY POLYURETHANE FOAM

- A. Foamed-In-Place Insulation: Medium-density, rigid or semi-rigid, closed cell polyurethane foam; foamed on-site, using blowing agent of water or non-ozone-depleting gas.
 - 1. Density In Place: Minimum 2.0 lb./cu ft.; ASTM D1622.
 - 2. Aged Thermal Resistance: R-value of 6.5 (deg F hr. sq. ft)/Btu, minimum, when tested at 1-inch thickness in accordance with ASTM C518 after aging for 180 days at 41 degrees F.
 - 3. Water vapor Permeance: vapor retarder; 2 perm, maximum, when tested at intended thickness in accordance with ASTM E96/E96M, desiccant method.
 - 4. Water Absorption: Less than 2 percent by volume, maximum, when tested in accordance with ASTM D2842.
 - 5. Air Permeance: 0.004 cfm/sq. ft, maximum, when tested at intended thickness in accordance with ASTM E2178 or ASTM E283 at 1.5 psf.
 - 6. Closed Cell Content: At least 90 percent.
 - 7. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.
 - 8. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
 - 9. Primer: Material recommended by insulation manufacturer where required for adhesion of insulation to substrates.

OPEN-CELL: ULTRA LOW VOC SPRAY POLYURETHANE FOAM

- A. Foamed-In-Place Insulation: Low-density, rigid or semi-rigid, open cell polyurethane foam; foamed on-site, using blowing agent of water or non-ozone-depleting gas.

1. Density in Place: Minimum 0.5 pcf when tested in accordance with ASTM D 1622.
2. Aged Thermal Resistance: R-Value when tested in accordance with ASTM C 518: 3.9 at 1 inch, 13 at 3.5 inches, 19 at 5.5 inches.
3. Oxygen Index: 25 when tested in accordance with ASTM D 2863.
4. Compressive Strength: 0.5 psi when tested in accordance with ASTM D 1621.
5. Fungi Resistance: Zero Rating when tested in accordance with ASTM G 21.
6. Air Leakage: Less than 0.02 (L/s)/m² when tested in accordance with ASTM E 283.
7. Sound Transmission Coefficient: 51 (STC) when tested in accordance with ASTM E 90.
8. Noise Reduction Coefficient: 0.7 (NRC) when tested in accordance with ASTM C 423.
9. Open Cell Content: Greater than 90 percent when tested in accordance with ASTM D 2846.
10. Tensile Strength: Less than 5 psi when tested in accordance with ASTM D 1623.
11. Shear Strength: 1.4 psi when tested in accordance with ASTM C 273.
12. Permeability: 21 perm-inch when tested in accordance with ASTM E 96.
13. Dimensional Stability: Less than 15 percent change in volume when tested in accordance with ASTM D 2126.
14. Surface Burning Characteristics:
 - a. Flame Spread/Smoke Developed: At maximum 4-inch (102 mm) thickness, flame spread index of less than 25 and a smoke developed index of less than 450 when tested in accordance with ASTM E 84.
 - b. Corner Test: Thickness up to 12 inches (305 mm) for wall cavities and 16 inches for ceiling cavities meets NFPA 286 when covered with 1/2-inch (13 mm) gypsum board or equivalent thermal barrier.
 - c. Primer as Applicable to Substrate: A water-based epoxy primer to achieve superior adhesion and penetration on concrete, masonry, metal, wood, etc. as approved by the manufacturer.

INSULATION FASTENERS

- A. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.
- B. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates without damaging insulation, fasteners, or substrates.
- C. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

INSTALLATION – GENERAL

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer with a minimum of five-years of proven experience. References of experience will be required in the application of spray foam insulation.
- B. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.
- C. Comply with insulation manufacturer's written instructions applicable to products and applications.
- D. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- E. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- F. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.
- G. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

072500 WEATHER BARRIERS**GENERAL**

- A. Weather Barrier: Assemblies that form either water-resistive barriers, air barriers, or vapor retarders.
- B. Air Barrier: Airtight barrier made of material that is relatively air impermeable but water vapor permeable, both to the degree specified, with sealed seams and with sealed joints to adjacent surfaces. Air barriers consist of materials that form a system to stop passage of air through exterior walls, joints between exterior walls and roof, and joints around frames of openings in exterior walls.
 - 1. Provide fluid applied air barriers or substrate materials with integrated air barriers that only require fluid applied flashing at joints/seams.
 - 2. The use of sheet wrap air barriers is prohibited.
- C. Coordination:
 - 1. Coordinate the installation of weather barriers with adjacent flashings and weather barriers for compatibility and continuity of those systems.
 - 2. Coordinate installation of flexible flashing at openings with Sections that specify window, door, and other opening installations.
- D. Product Data: Provide data on system materials and accessory components, material characteristics, performance criteria, limitations, and manufacturer's standard flashing and termination details.
- E. Manufacturer's Installation Instructions: Indicate substrate and surface preparation, installation methods, and storage and handling criteria.

- F. Installer Qualifications: Company specializing in performing the work of this Section with minimum three years of documented experience; approved by primary weather barrier system manufacturer.
- G. Copies of Documents at Project Site: Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- H. System Compatibility: Assume responsibility for confirming that weather barrier system components are compatible with each other as a system, and also compatible with substrate surfaces with which they will be in contact, including but not limited to wall and sheathing surfaces, opening materials, other flashings and weather barrier materials, and joint sealants.

PRODUCTS

- A. Air Barrier Membrane Coating
 - 1. Material: Water-based acrylic.
 - 2. Adhesion to Paper and Glass Mat Faced Sheathing: Sufficient to ensure failure due to delamination of sheathing.
 - 3. Air Permeance: 0.004 cubic feet per minute per square foot, maximum, when tested in accordance with ASTM E2178.
 - 4. Water vapor Permeance: 5 perms, minimum, when tested in accordance with ASTM E96/E96M, Procedure B.
 - 5. Ultraviolet and Weathering Resistance: Approved in writing by manufacturer for minimum of 4 months weather exposure.
 - 6. Elongation: 300 percent, minimum, when tested in accordance with ASTM D412.
 - 7. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.
 - 8. Nail Sealability: Pass, when tested in accordance with ASTM D1970/D1970M.
 - 9. Accessories: As recommended by coating manufacturer.
- B. Butyl Rubber Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch.
 - 1. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.
 - 2. Primers: As required by flashing manufacturer to prepare substrates for flexible flashing adhesion.

EXECUTION

- A. Verify that surfaces and conditions are ready to accept the work of this Section.
- B. Do not begin installation until substrates have been properly prepared.
- C. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

- D. Clean and prime substrates receiving weather barrier coatings or adhered sheets in accordance with weather barrier system manufacturer's requirements to allow proper bond of applied weather barrier system.
- E. Do not cover installed weather barriers until required inspections have been completed.
- F. Obtain approval of installation procedures by the weather barrier manufacturer based on a mock-up installed in place, prior to proceeding with remainder of installation.
- G. Take digital photographs of each portion of the installation prior to covering up.
- H. Do not leave materials exposed to weather longer than recommended by manufacturer.
- I. Coatings:
 - 1. Prepare substrate in manner recommended by coating manufacturer; treat joints in substrate and between dissimilar materials as recommended by manufacturer and as otherwise specified.
 - 2. Use flexible flashing to seal to adjacent construction and to bridge joints according to manufacturer's recommendations and standard flashing and termination details adapted as required to indicated project conditions; lap flashing over separate metal or flexible flashings in shingle fashion to shed water and seal laps.
 - 3. Provide flexible flashing or extra thickness of reinforced coating at all changes in plane, intersections with other weather barriers, flashings, and other components of the weather barrier enclosure.
 - 4. Openings and Penetrations in Exterior Weather Barriers:
 - a. Install flexible flashing over sills, covering entire sill frame member, extending at least 5 inches onto weather barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
 - b. At openings to be filled with non-flanged frames, seal weather barrier to all sides of opening framing, using flexible flashing at least 9 inches wide, covering entire depth of framing.
 - c. At head of openings, install flexible flashing under weather barrier extending at least 2 inches beyond face of jambs; seal weather barrier to flashing.
 - d. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
 - e. Service and other Penetrations: Form flexible flashing around penetrating item and seal to weather barrier surface.
 - 5. Flexible Flashing:
 - a. Where indicated to comply with manufacturer's written instructions.
 - b. Prime substrates as recommended by flashing manufacturer.
 - c. Lap seams and junctures with other materials at least 4 inches except that at flashing flanges of other construction, laps need not exceed flange width.
 - d. Lap flashing over water-resistive barrier at bottom and sides of openings.

- e. Lap water-resistive barrier over flashing at heads of openings.
- f. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.
 - i. Attach fabric-side out.
 - ii. Butt tightly at all openings and equipment.
 - iii. Install with corrosion-resistant fasteners.
 - iv. At stucco and masonry veneer, install a foundation weep screed at the bottom of the mat, with top leg of weep screed under the continuous exterior weather barrier.

074213.13 FORMED METAL WALL PANELS

GENERAL

- A. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
- B. Composite panel manufacturer shall have a minimum of 20 years' experience in the manufacturing of this product.
- C. Installer Qualifications: Company specializing in installing the products specified in this Section with minimum three years of documented experience.
- D. Coordination:
 - 1. Coordinate placement of wall panel system anchors and back-up support framing.
 - 2. Coordinate installation of vapor retarder and air barrier seals.
- E. Preconstruction Meeting: Convene one week before starting work of this Section.
 - 1. Convene under general provisions of Section 01 7000.
 - 2. Require attendance by the installer and relevant sub-Contractors.
 - 3. Include metal sheet manufacturer's representative and wall system manufacturer's representative to review storage and handling procedures.
- F. Shop Drawings:
 - 1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
 - 2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches.
- G. Samples for Initial Selection: For each type of metal panel indicated with factory-applied finishes.
 - 1. Include two 12x12 samples of trim and accessories involving color selection.
- H. Mock-up: Construct metal wall panel system as part of exterior wall mock-up, as indicated on Drawings; include subgirt system, accessories, trims, wall openings, flashings (with lap joint, corner, and end dam), and wall insulation with integrated weather barrier system in mock-up.

- I. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.
 - 1. Store prefabricated material off ground and protected from weather. Prevent twisting, bending, or abrasion, and provide ventilation to stored materials. Slope metal sheets to ensure drainage.
 - 2. Prevent contact with materials that may cause discoloration or staining of products.
- J. Correct defective work within a twenty-year period after the Date of Substantial Completion for degradation of panel finish, including color fading caused by exposure to weather.
- K. Correct defective work within a one-year period after the Date of Substantial Completion, including defects in water tightness and integrity of seals.

PRODUCTS

A. Wall Panel System:

- 1. Factory fabricated prefabricated metal panel system, concealed fastener type, site assembled.
- 2. Provide exterior panels.
 - a. Design and size components to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of wall.
 - b. Design Pressure: In accordance with applicable codes.
 - c. Maximum Allowable Deflection of Panel: 1/90 of span.
 - d. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement within system; movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.
 - e. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
 - f. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.
 - g. Corners: Factory-fabricated in one continuous piece with minimum 18-inch returns.
 - h. Provide continuity of air barrier and vapor retarder seal at building enclosure elements in conjunction with materials specified in the Contract Documents and Specifications.

3. Soffit Panel System:

- a. L-Panel, B-6 Panel or Flush Seam Panel.
 - i. 22 gage thick precoated steel sheet.
 - ii. Color: As indicated on contractor Documents and Specifications.
- b. Subgirts: Hat channel profile; galvanized steel with G90/Z275 coating, 20 gage minimum thickness, in configuration as required by system

manufacturer to attach panel system to studs through continuous insulation. Depths 7/8" and 1 1/2" as indicated on Drawings.

- c. Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system; shop cut and factory mitered to required angles.
 - d. Expansion Joints: Same material, thickness and finish as exterior sheets; 24 gage, 0.025 inch thick; manufacturer's standard brake formed type, of profile to suit system.
 - e. Trim: Same material, thickness and finish as exterior sheets; brake formed to required profiles.
 - f. Anchors: Galvanized steel.
4. Decorative Custom Metal Panels:
- a. Wall Panel System: Artisan Panels Inc. - Custom fabricated prefinished metal panel system.
 - b. Thickness: 1/4" steel.
 - c. Design: Custom designs as indicated on Contract Documents.
 - d. Mounting: Hidden standoffs with tab mounts.
5. Materials:
- a. Precoated Steel Sheet: Hot-dipped galvanized steel sheet, ASTM A653/A653M Structural Steel (SS) or Forming Steel (FS), with G90/Z275 coating; continuous coil-coated on exposed surfaces with specified finish coating and on panel back with specified panel back coating.
6. Panel Finish:
- a. Fluoropolymer Coating System: Manufacturer's standard multi-coat thermocured coating system, including minimum 70 percent fluoropolymer color topcoat with minimum total dry film thickness of 0.9 mil; color and gloss as selected by District Project Manager from manufacturer's full line. Kynar 500 or Hylar 5000 topcoat, over chrome phosphate primer.
7. Accessories:
- a. Gaskets: Manufacturer's standard type suitable for use with system, permanently resilient; ultraviolet and ozone resistant.
 - b. Sealants: Manufacturer's standard type suitable for use with installation of system; non-staining; color as selected.
 - i. Use pick-proof caulk/sealant when metal panels are installed in accessible areas.
 - c. Fasteners: Manufacturer's standard type to suit application; with soft neoprene washers, steel, hot dip galvanized. Exposed fasteners same finish as panel system.
 - d. Metal-to-Metal Fasteners: Self-drilling, self-tapping screws.

- e. Load-Bearing Fasteners Through Continuous Insulation: Galvanized or corrosion resistant threaded fasteners specifically approved for attachment of subgirts through continuous insulation and into studs; size and spacing complying with FSC The Load Guide.
 - f. Length as required to penetrate minimum 3 thread penetration through metal studs.
 - g. Field Touch-up Paint: As recommended by panel manufacturer.
 - h. Bituminous Paint: Asphalt base.
8. Fabrication:
- a. Fabricate and finish wall panels within manufacturer's facilities and fulfill indicated performance requirements demonstrated by laboratory testing.
 - b. Comply with indicated profiles and with dimensional and structural requirements.
 - c. Form sections true to shape, accurate in size, square, and free from distortion or defects.
 - d. Form pieces in longest practicable lengths.
 - e. Fabricate corners in one continuous piece with minimum 12-inch returns.

EXECUTION

- A. Verify that framing members are ready to receive panel subgirt system anchorage.
- B. Verify that weather barrier has been installed over continuous insulation completely and correctly.
- C. Install subgirts perpendicular to panel length, shimmed and leveled to uniform plane, and securely fastened to studs through continuous insulation with load-bearing fasteners, spaced and sized complying with FSC The Load Guide, and as required by panel system manufacturer.
 - 1. Where required by panel layout or alignment, install second layer of subgirts across entire wall plane, perpendicular to first layer, spaced as required by panel system manufacturer.
- D. Install panels on walls in accordance with manufacturer's instructions and approved shop drawings.
- E. Protect surfaces in contact with cementitious materials and dissimilar metals with bituminous paint. Allow to dry prior to installation.
- F. Install starter and edge strips before panels are installed. Lap weather barrier flashing materials to shed water.
- G. Fasten panels to plywood and/or matt sheathing as detailed on Drawings; aligned, level, and plumb.
 - 1. Before installation of subgirt supports over primary weather barrier sheet, apply single continuous strip of self-adhered flexible flashing sheet on primary weather barrier sheet as specified in Section 07 2500. Position strip centered on subgirt and size strip minimum 1 inch wider than subgirt assembly.

- H. Locate joints over supports. Lap panel ends minimum 2 inches.
- I. Provide expansion joints where indicated.
- J. Use concealed fasteners unless otherwise approved by architect.
- K. Separate dissimilar metals and use gasketed fasteners where needed to eliminate the possibility of corrosive or electrolytic (galvanic) action between metals.
- L. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.
- M. Maximum offset From True Alignment Between Adjacent Members Butting or In Line: 1/16 inch.
- N. Maximum variation from Plane or Location Indicated on Drawings: 1/4 inch.
- O. Remove site cuttings from finish surfaces.
- P. Remove protective plastic film from panel surfaces.
- Q. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.
- R. Protect installed metal wall panel system from damage during construction.

ROOFING SYSTEMS

GENERAL

- A. District's preferences of roofing systems are listed in chronological order:
 - 1. 4-Ply Built-Up roofing with ballast/ flood gravel.
 - 2. 2-Ply Modified Bitumen - atactic polypropylene (APP) with ballast/ flood gravel.
 - 3. 2-Ply Modified Bitumen - styrene-butadiene-styrene (SBS) with ballast/ flood gravel.
 - 4. Standing Seam Metal Roofing.
 - 5. Ethylene-propylene-diene-terpolymer (EPDM) 115 Mil – fleece backed.
 - 6. Ethylene-propylene-diene-terpolymer (EPDM) (60 Mil).
- B. Coping shall be 24-gauge minimum.
- C. Roof shall have a 2-year workmanship warranty.
- D. Roof shall have a 20-year manufacturer's warranty.
- E. Roof warranty shall be for 55 mph wind speed .
- F. Coping finish shall have a 20-year manufacturer's warranty.
- G. Roofs shall be rated for a minimum of 130 mph (V Ultimate) basic wind speed (100 mph design wind speed) per PPRBD.
- H. Insulation shall be mechanically fastened per manufacturer's recommendations. Insulation R-value shall comply with the International Energy Conservation Code – Latest Edition.
- I. Insulation for existing roofing system shall match the thickness of the existing insulation. Verify compressive strength and density of existing roof.
- J. Deck sheathing and cover board substrates shall be provided as indicated by the Contract Documents and Specifications and/ or manufactures recommendations.

- K. Provide required roof expansion joints per manufacturers recommendations and requirements.
- L. Ensure assembly complies with all applicable codes and manufacturer's recommendations.
- M. Roof Hatches:
 - 1. Metal roof-hatch units with lids and insulated double-walled curbs, welded or mechanically fastened and sealed corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing, straight sides, and integrally formed deck-mounting flange at perimeter bottom.
 - 2. Bilco Type E-50TB (thermally broken) or comparable
 - 3. Minimum Size: 36" x 48"
 - 4. Provide a retractable-style ladder safety post at each roof hatch.
- N. All products listed in this section are to be installed by a single installer with a minimum of five (5) years demonstrated experience in installing products of the same type and scope as specified.
- O. Peripheral roof-mounted equipment shall only be installed with the permission of the District's Facilities Management:
 - 1. Approved equipment shall be installed with a Non-penetrating roof mount mast skid.
 - 2. Mast skid shall be sized per manufacturer recommendations to adequately support the equipment.
 - 3. Mast skid shall be placed on ½" thick rubber mat that extends a minimum of 12" past each side of the mast skid.

076000 FLASHING AND SHEET METAL

GENERAL

- A. Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
- D. Fabricator and installer qualifications: company specializing in sheet metal work with 10 years of documented experience.

PRODUCTS

- A. Metallic-Coated Steel Sheet:

1. Provide zinc-coated (galvanized) steel sheet according to ASTM A 653/A 653M, G90 coating designation; pre-painted by coil-coating process to comply with ASTM A 755/A 755M.
 - a. Surface: Smooth, flat.
 - b. Exposed Coil-Coated Finish:
 - i. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - ii. Thickness: Minimum 24 Gauge.
 - c. Color: As selected by District Project Manager from manufacturer's full range.
- B. Underlayment Materials:
 1. Self-Adhering, High-Temperature Sheet: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.
 2. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F or higher.
 3. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F or lower.
- C. Miscellaneous Materials:
 1. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.
 2. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 3. Exposed Fasteners: Only where approved, heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
 4. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
- D. Fasteners for Sheet: Copper, hardware bronze or passivated Series 300 stainless steel.
- E. Fasteners for Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.
- F. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2-inch-wide and 1/8 inch thick.

- G. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- H. Reglet Fasteners: Surface mounted type, galvanized steel; face and ends covered with plastic tape.

EXECUTION

- A. Examine substrates, areas, and conditions, with installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
- B. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller. Cover underlayment within 14 days.
- C. Apply slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.
- D. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system in strict accordance with manufacturers installation requirements. Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
- F. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
- G. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- H. Seal joints as required for watertight construction.
- I. Installation Tolerances:
 - 1. Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
 - 2. Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."
- J. Cleaning and Protection:
 - 1. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

2. Clean and neutralize flux materials. Clean off excess solder.
3. Clean off excess sealants.
4. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.
5. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

078413 PENETRATION FIRESTOPPING

GENERAL

- A. Coordinate installation of firestopping systems with affected trades and adjacent work.
- B. Sequence work to permit firestopping materials to be installed after adjacent and surrounding work is complete.
 1. Do not cover or conceal firestopping installations until District 20's inspection agency and jurisdictional authority have inspected each installation.
 2. Provide one-week advanced notification to District Project Manager and District 20's inspection agency to schedule inspections.
- C. Submittals:
 1. For each penetration firestopping system, include location and design designation of qualified testing and inspecting agency.
 2. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.
 3. Jurisdictional Authority Submittal: Prior to submission to architect, submit to jurisdictional authority and local fire department complete product data indicating proposed product characteristics, performance characteristics, limitation criteria, and documentation of proposed firestop materials and systems for actual project conditions.
 - a. Include manufacturer's complete installation instructions and UL Design or other approved testing agency data sheets for each proposed firestop system.
 - b. Include complete test data forms or jurisdictional acceptance for proposed assemblies not conforming to specific UL Design numbers or other approved testing agency system designs.
 - c. Submit certificate from authority having jurisdiction indicating approval of materials and systems to be used, with one complete copy, for information only, of the approved jurisdictional authority submittal.

- d. If the jurisdictional authority does not require a submission, submit this same package to architect.
- D. Include agreement to repair or replace joint sealers which fail in joint adhesion, extrusion resistance, migration resistance, general durability, or apparent deterioration beyond manufacturer's printed limitations for stipulated warranty period from Date of Substantial Completion.
- E. Provide a Fire-Resistant Air Barrier Assembly when required.

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Division 08 – Openings

GENERAL

- A. Door assemblies shall be a minimum of 36" wide.
- B. Products shall be produced, manufactured and assembled in the USA.
- C. Exterior door and window assemblies and systems shall be thermally broken.
- D. Exterior glazing shall meet the requirements of the International Energy Conservation Code (Latest Edition).
- E. Storefront and curtain wall system assemblies shall be installed on a minimum 6" tall concrete curb system.
- F. Exterior doors associated with corridors shall have a vestibule at each location to serve as a bugger between the interior and exterior of the building.
- G. Reception transaction window shall have an operable portion that opens no more than 18" with a stop mechanism at 8" accessible from the reception side. Stop mechanism must be over ridden from reception side in order for window to open to 18". All glazing shall be full frame including slider window. All reception area glazing shall have 3M film.
- H. Fire rated assemblies and accessories, including smoke and draft control assemblies, shall comply with all applicable codes and standards.
- I. Manufacturer Qualifications:
 - 1. Company specializing in manufacturing the products specified in Contract Documents and Specifications with minimum five years documented experience.
 - 2. Source Limitations: Obtain materials from single source from single manufacturer.
- J. Installers Qualifications: Company specializing in installing products as specified in the Contract Documents and Specifications with a minimum of five years documented experience.
- K. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.
- L. Submittals:
 - 1. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes.
 - 2. Shop Drawings: Provide the following at a minimum:
 - a. Elevations of each door and window type.
 - b. Details of doors and windows, including vertical- and horizontal-edge details and metal thicknesses.
 - c. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - d. Locations of reinforcement and preparations for hardware.
 - e. Details of each different wall opening condition.

- f. Details of anchorages, joints, field splices, and connections.
 - g. Details of accessories.
 - h. Details of moldings, removable stops, and glazing.
 - i. Details of conduit and preparations for power, signal, and control systems.
- 3. Samples for Initial Selection: For units with factory-applied color finishes.
- 4. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.
 - a. Tinted glass.
 - b. Coated glass.
 - c. Laminated glass.
 - d. Insulating glass.
- 5. Glazing Accessory Samples: For sealants and colored spacers, in 12-inch lengths.
- 6. Door Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Contract Documents and Specifications. Coordinate with final Door Hardware Schedule.
- 7. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Contract Documents and Specifications.
- 8. Keying Schedule: List levels of keying as well as explanation of key system's function, key symbols used, and door numbers controlled.
- M. Provide mock-up including all components occurring on project. Assemble to illustrate component assembly including glazing materials, weep drainage system, attachments, anchors, insulation, window washing tiebacks, finishes, and perimeter sealant.
 - 1. Scope of mock-up is as shown on mock-up scope drawings.
 - 2. Do not use excessive amounts of sealant, nor other special measures or techniques, which are not representative of those to be used on the building.
- N. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during remainder of construction period.
- O. Warranty:
 - 1. Hollow Metal Doors and Frames:
 - a. Defective Work within a two-year period after Date of Substantial Completion. Replace parts that fail under normal use at no extra charge to District 20.
 - 2. Wood Doors:
 - a. Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

- b. Failures include, but are not limited to, the following:
 - i. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
 - ii. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
 - iii. Delamination of veneer.
 - c. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 - d. Warranty Period for Solid-Core Interior Doors: Life of installation.
3. Overhead Coiling Doors & Operators:
- a. Manufacturer:
 - i. (1) Year: Against all defects in workmanship and materials.
 - ii. (5) Year: Operator – Against electric motor, transmission and workmanship.
 - iii. (25) Year: Against weather including chipping cracking and peeling of paint or finish.
 - iv. (10-20) Years: Against chalk and fade of paint or finish.
 - b. Installer:
 - i. (2) Year: Defective parts or workmanship.
4. Aluminum-Framed Storefronts:
- a. Correct defective Work within a two-year period after the Date of Substantial Completion.
 - b. Provide five-year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.
 - c. Provide 10-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.
5. Glazed Aluminum Curtain Walls:
- a. Correct defective Work within a two-year period after Date of Substantial Completion.
 - b. Provide ten-year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.
 - c. Provide twenty-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, flaking, pitting, peeling, crazing, or non-uniformity of finish.
6. Tubular Skylights:
- a. Correct defective Work within a two-year period after the Date of Substantial Completion.

- b. Daylighting Device: Manufacturer's standard warranty for 10 years.
- 7. Glazing:
 - a. Correct defective Work within a two-year period after the Date of Substantial Completion.
 - b. Coated-Glass Products: Manufacturer's standard warranty for 10 years.
 - c. Laminated Glass: Manufacturer's standard warranty for 10 years.
 - d. Insulating Glass: Manufacturer's standard warranty for 10 years.
- 8. Door Hardware:
 - a. Correct defective Work within a two-year period after the Date of Substantial Completion.
 - b. Closers: Mechanical: 30 years.
 - c. Automatic Operators: 2 years.
 - d. Exit Devices: Mechanical: 3 years.
 - e. Locksets: Mechanical: 10 years.
 - f. Continuous Hinges: 10 years.
 - g. Key Blanks: Lifetime.

PRODUCTS

A. Hollow Metal Doors and Frames:

1. Interior Doors:

- a. Non-Fire-Rated:
 - i. Fully welded.
 - ii. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - iii. Level 3 - Extra Heavy-duty.
 - iv. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
 - v. Model 1 - Full Flush.
 - vi. Door Face Metal Thickness: 16 gage, 0.053-inch, minimum.
 - vii. Core Material: Vertical steel stiffeners.
 - viii. Door Thickness: 1 3/4-inch, nominal.
 - ix. Door Finish: Factory primed and field finished.
- b. Fire-Rated:
 - i. Fully welded.
 - ii. Grade: ANSI A250.8 Level 4, physical performance Level A, Model 1, full flush.
 - iii. Fire Rating: As indicated on Contact Documents and Specifications:

(A) Provide units listed and labeled by UL.

- (B) Attach fire-rating label to each fire rated unit.
 - iv. Door Face Metal Thickness: 16 gage, 0.053 inch, minimum.
 - v. Core: Mineral fiberboard. Vertical steel ribs.
 - vi. Thickness: 1-3/4 inches.
- c. Interior Frames:
 - i. Non-Fire Rated:
 - (A) Full profile/continuously welded.
 - (B) Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
 - (C) Frame Finish: Factory primed and field finished.
 - ii. Fire-Rated:
 - (A) Full profile/continuously welded.
 - (B) Fire Rating: Same as door, labeled.
 - (C) Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
 - (D) Frame Finish: Factory primed and field finished.
- d. Exterior Doors:
 - i. Thermally insulated; fully welded.
 - ii. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - (A) Level 4 - Maximum-duty.
 - (B) Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
 - (C) Model 1 - Full Flush.
 - (D) Door Face Metal Thickness: 14 gage, 0.067 inch, minimum.
 - (E) Zinc Coating: A60/ZF180 galvanized coating; ASTM A653/A653M.
 - iii. Core Material: Polyurethane, 1.8 lbs./cu ft minimum density.
 - iv. Door Thermal Resistance: R-Value of 8.7, minimum, for installed thickness of polyurethane.
 - v. Door Thickness: 1 3/4-inch, nominal.
 - vi. Weatherstripping: Factory or field installed to achieve performance ratings as published by manufacturer.
 - vii. Door Finish: Factory primed and field finished.
- e. Exterior Door Frames:
 - i. Full profile/continuously welded.
 - ii. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvanized) in accordance with ASTM A653/A653M, with A60/ZF180 coating.
 - iii. Frame Metal Thickness: 14 gage, 0.067-inch, minimum.

- iv. Frame Finish: Factory primed and field finished.
- v. Weatherstripping: Factory or field installed to achieve performance ratings as published by manufacturer.
- f. Mullions for Pairs of Doors:
 - i. Removable type, with keyed cylinder, profile similar to jambs.
 - ii. Vertical rods shall be exposed type. The use of internal vertical rods is prohibited.
- g. Borrowed Lites Glazing Frames: Construction and face dimensions to match typical interior metal door frames, and as indicated on Contract Documents and Specifications, minimum 16 gage thickness, unless otherwise indicated.
- h. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry to be grouted.
- i. Frames in Masonry Walls: Size to suit masonry coursing with head member 4-inch high to fill opening without cutting masonry units.
- j. Frames Wider than 48 Inch: Reinforce with steel channel fitted tightly into frame head, flush with top.
- k. Reinforcing Frame:
 - i. Hinge reinforcement for metal frames with wood doors:
 - (A) Thickness: 3/16".
 - (B) Length: 12".
 - (C) Width: full width of frame (frame face to frame face).
 - (D) Number of spot welds above and below each cutout: 6 and shall be 3/16" in diameter.
 - ii. Hinge reinforcement for metal frames with metal doors:
 - (A) Thickness: 1/4".
 - (B) Length: 18".
 - (C) Width: full width of frame (frame face to frame face).
 - (D) Number of spot welds above and below each cutout: 8 and shall be 3/16" in diameter.
 - iii. For continuous hinged door, reinforcing shall be full width and full length of frame. Reinforcing shall have minimum thickness of 1/8", welds shall be 1" long located on 8" centers at each face of frame.
 - iv. Strike, flush bolt, hold-open and all surface-mounted hardware: 12-gauge.
 - v. Closer and brackets: 3/16" on frame. 12-gauge angle on door.
 - vi. For door openings wider than 42" and for multiple openings, head members shall be reinforced full-length with 12-gauge angle or channel stiffeners.
 - vii. Reinforcing plates shall be one-piece integral units, bent for flush mounting of hinges.
- l. Frames for Exterior Entry Doors: Provide cutout in frame to allow for installation of Concealed Electrical Power Transfers.
- m. Provide cover boxes in back of all hardware cutouts.
- n. Provide metal adjustable clip angles spot-welded to bottom of each door jamb member; provide holes in angles to receive floor anchorage.
- o. Grout for Frames: Portland cement grout with maximum 4-inch slump for hand troweling; thinner pumpable grout is prohibited.

- p. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.
- 2. Flush Wood Doors:
 - a. Fire-Rated Wood Doors:
 - i. Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252.
 - ii. Cores: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
 - iii. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
 - iv. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
 - b. Interior Solid-Core Doors:
 - i. Grade: Custom (Grade A faces).
 - ii. Species: Select white birch.
 - iii. Cut: Plain sliced (flat sliced).
 - iv. Match between Veneer Leaves: Book match.
 - v. Assembly of Veneer Leaves on Door Faces: Center-balance match.
 - vi. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
 - vii. Blueprint Match: Where indicated, provide doors with faces produced from same flitches as adjacent wood paneling and arranged to provide blueprint match with wood paneling. Comply with requirements of the Contract Documents and Specifications.
 - viii. Exposed Vertical Edges: Same species as faces or a compatible species - edge Type A.
 - ix. Core: Structural Composite Lumber, Stave Lumber or Mineral.
 - x. Construction: Five or seven plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering. Faces are bonded to core using a hot press.
- 3. Access Door and Panels:
 - a. Flush Access Doors with Exposed Flanges:
 - i. Face of door flush with frame, with exposed flange and concealed hinge.

- ii. Locations: Wall and ceiling. Access panels/doors are to be provided at each hammer arrestors, water line valve, sprinkler line valve in locations where sprinklers heads and water piping are located above gypsum wallboard lids.
 - iii. Door Size: 24" x 24" minimum.
 - iv. Uncoated Steel Sheet for Door: Nominal 0.060-inch, 16 gage, factory primed.
 - v. Frame Material: Same material, thickness, and finish as door.
 - vi. Latch and Lock: Tamperproof tool-operated cam latch.
 - b. Fire-Rated, Flush Access Doors with Exposed Flanges:
 - i. Door face flush with frame, with a core of mineral-fiber insulation enclosed in sheet metal, with exposed flange, self-closing door, and concealed hinge.
 - ii. Locations: Wall and ceiling.
 - iii. Door Size: 24" x 24" minimum.
 - iv. Fire-Resistance Rating: Not less than that of adjacent construction and on Construction Documents and Specifications.
 - v. Temperature-Rise Rating: 250 deg F at the end of 30 minutes.
 - vi. Uncoated Steel Sheet for Door: Nominal 0.060-inch, 16 gage, factory primed.
 - vii. Frame Material: Same material, thickness, and finish as door.
 - viii. Latch and Lock: Self-latching door hardware, tamperproof tool-operated cam latch.
4. Overhead Coiling Doors and Operators:
- a. Non-Fire-Rated Interior Coiling Doors:
 - i. Steel slat curtain.
 - ii. Single thickness slats.
 - iii. Nominal Slat Size: 2 inches wide x required length.
 - iv. Finish: No. 4 - Brushed.
 - v. Guides, Angles: Stainless steel.
 - vi. Hood Enclosure: Manufacturer's standard; stainless steel.
 - vii. Electric operation.
 - viii. Mounting: Within framed opening.
 - ix. Locking Devices: Cylinder furnished.
 - b. Exterior Service Door:
 - i. Overhead coiling door formed with curtain of interlocking metal insulated slats.

- ii. Operation Cycles: Door components and operators capable of operating for not less than 10,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.
 - (A) Include tamperproof cycle counter.
- iii. Door Curtain Material: Stainless steel, 16-gauge minimum thickness.
- iv. Door Curtain Slats: Flat profile slats of 1-7/8-inch center-to-center height.
 - (A) Gasket Seal. Manufacturer's standard continuous gaskets between slats.
- v. Bottom Bar: Two angles, each not less than 1-1/2 by 1-1/2 by 3/16-inch thick; fabricated from stainless steel and finished to match door.
- vi. Hood: Match curtain material and finish.
 - (A) Mounting: Face of wall.
- c. Electric Operator:
 - i. Usage Classification: Heavy duty, 25 or more cycles per hour and over 90 cycles per day.
 - ii. Operator Location: As shown on Contract Documents and Specifications.
 - iii. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use; moving parts of operator enclosed or guarded if exposed and mounted at 8 feet or lower.
 - iv. Motor:
 - (A) Exposure: Interior.
 - (B) Reversible-type with controller (disconnect switch) for motor exposure indicated.
 - (C) Equip with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.
 - v. Obstruction-Detection Device: Automatic photoelectric sensor.
 - vi. Control Station(s):
 - (A) Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure push-button control labeled "Close."
 - (1) Interior-Mounted Units: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
 - vii. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design

manual mechanism so required force for door operation does not exceed 30 lbf.

- viii. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

5. Aluminum-Framed Storefronts:

a. Performance Requirements:

- i. Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts without failure due to defective manufacture, fabrication, installation, or other defects in construction.
- ii. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
- iii. Failure also includes the following:
 - (A) Thermal stresses transferring to building structure.
 - (B) Glass breakage.
 - (C) Noise or vibration created by wind and thermal and structural movements.
 - (D) Loosening or weakening of fasteners, attachments, and other components.
 - (E) Failure of operating units.
- iv. Structural Loads:
 - (A) Wind Loads: As indicated on Contract Documents and Specifications.
 - (B) Other Design Loads: As indicated on Contract Documents and Specifications.
- v. Deflection of Framing Members: At design wind pressure, as follows:
 - (A) Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding $1/175$ of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to $3/4$ inch, whichever is less.
 - (B) Deflection Parallel to Glazing Plane: Limited to $1/360$ of clear span or $1/8$ inch, whichever is smaller.

- (1) Operable Units: Provide a minimum 1/16-inch clearance between framing members and operable units.
 - (C) Cantilever Deflection: Where framing members overhang an anchor point, as follows:
 - (1) Perpendicular to Plane of Wall: No greater than 1/240 of clear span plus 1/4 inch for spans greater than 11 feet 8-1/4 inches or 1/175 times span, for spans less than 11 feet 8-1/4 inches.
- vi. Structural: Test according to ASTM E 330 as follows:
 - (A) When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
 - (B) When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
 - (C) Test Durations: As required by design wind velocity, but not less than 10 seconds.
- vii. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
 - (A) Fixed Framing and Glass Area:
 - (1) Maximum air leakage of 0.06 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.
 - (B) Entrance Doors:
 - (1) Pair of Doors: Maximum air leakage of 1.0 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.
 - (2) Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.
- viii. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:
 - (A) No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.
- ix. Energy Performance: Certify and label energy performance according to NFRC as follows:
 - (A) Thermal Transmittance (U-Factor): Provide U-factor for the following glazing and framing areas of not more than:

- (1) Fixed Fenestration: TBD.
 - (2) Operable Fenestration: TBD.
 - (3) Entrance Doors: TBD.
 - (B) Solar Heat Gain Coefficient: The following glazing and framing areas shall have a solar heat gain coefficient of no greater than:
 - (1) South, East, West Orientation: TBD.
 - (2) North Orientation: TBD.
 - (C) Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than 45 as determined according to NFRC 500.
 - (D) Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:
 - (1) Temperature Change: 0 - 120 deg F, ambient; 180 deg F, material surfaces.
- b. Framing:
- i. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
 - ii. Framing Members: Manufacturer's extruded- or formed- aluminum framing members of thickness required and reinforced as required to support imposed loads.
 - (A) Construction: Thermally broken.
 - (B) Cross-Section: 2-1/4 x 4-1/2-inch nominal dimension.
 - (C) Glazing System: Retained mechanically with gaskets on four sides.
 - (D) Glazing Plane: Center.
 - (E) Fabrication Method: Field-fabricated stick system.
 - iii. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
 - iv. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with non-staining, nonferrous shims for aligning system components.
 - v. Materials:
 - (A) Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - (1) Sheet and Plate: ASTM B 209.

- (2) Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
 - (3) Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
 - (4) Structural Profiles: ASTM B 308/B 308M.
- c. Installation: Provide 6" curb minimum between bottom of storefront system and finished floor for ease of cleaning.
- d. Sun Control Devices:
 - i. Sunshades: Assemblies consisting of manufacturer's standard outrigger brackets, louvers, and fascia, designed for attachment to curtain wall with mechanical fasteners.
 - (A) Orientation: Horizontal.
 - (B) Projection from Wall: As indicated on Contract Documents and Specifications.
 - (C) Outriggers: Tapered.
 - (D) Louvers:
 - (1) Number: As indicated on Contract Documents and Specifications.
 - (2) Shape: Airfoil.
 - (3) Width: 6 inches.
 - (4) Mounting Angle: As indicated on Contract Documents and Specifications.
 - ii. Fasciae: Rectangular.
 - iii. Finish: Match adjacent glazed aluminum storefront.
- e. Entrance Door Systems:
 - i. Manufacturer's standard glazed entrance doors for manual-swing operation.
 - ii. Door Design:
 - (A) Configuration: As indicated on Contract Documents and Specifications.
 - (B) Profile: Wide style.
 - (C) Thickness: 2.25 inches.
 - (D) Material Thickness: .1875 inches
 - (E) Top Rail: 5 inches wide.
 - (F) Vertical Stiles: 5 inches wide.
 - (G) Bottom Rail: 10 inches wide.
 - (H) Glazing Stops and Gaskets: Beveled, snap-on, extruded-aluminum stops and preformed gaskets.
 - (I) Finish: Same as storefront.

- (J) Construction: Internally welded stile and rail joints.
- (K) Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.

6. Glazed Aluminum Curtain Walls:

a. Performance:

- i. Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts without failure due to defective manufacture, fabrication, installation, or other defects in construction.
 - (A) Glazed aluminum curtain walls shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
 - (B) Failure also includes the following:
 - (1) Thermal stresses transferring to building structure.
 - (2) Glass breakage.
 - (3) Noise or vibration created by wind and thermal and structural movements.
 - (4) Loosening or weakening of fasteners, attachments, and other components.
 - (5) Failure of operating units.
- ii. Structural Loads:
 - (A) Wind Loads: As indicated on Contract Documents and Specifications.
 - (B) Other Design Loads: As indicated on Contract Documents and Specifications.
- iii. Deflection of Framing Members: At design wind pressure, as follows:
 - (A) Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding 1/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
 - (B) Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch, whichever is smaller.
- iv. Cantilever Deflection: Where framing members overhang an anchor point, as follows:
 - (A) Perpendicular to Plane of Wall: No greater than 1/240 of clear span plus 1/4-inch for spans greater than 11 feet

8-1/4 inches or 1/175 times span, for spans less than 11 feet 8-1/4 inches.

- v. Structural: Test according to ASTM E 330 as follows:
 - (A) When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
 - (B) When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
 - (C) Test Durations: As required by design wind velocity, but not less than 10 seconds.
- vi. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
 - (A) Fixed Framing and Glass Area: Maximum air leakage of 0.06 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.
- vii. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:
 - (A) No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.
- viii. Energy Performance: Certify and label energy performance according to NFRC guidelines.
- ix. Thermal Transmittance (U-Factor): Provide U-factor for the following glazing and framing areas of not more than:
 - (A) Fixed Fenestration: TBD.
 - (B) Operable Fenestration: TBD.
 - (C) Entrance Doors: TBD.
- x. Solar Heat Gain Coefficient: The following glazing and framing areas shall have a solar heat gain coefficient of no greater than:
 - (A) South, East, West Orientation: TBD.
 - (B) North Orientation: TBD.
- xi. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than 45 as determined according to NFRC 500.
- xii. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:
 - (A) Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

- (B) Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
- (C) High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg.
- (D) Low Exterior Ambient-Air Temperature: 0 deg F.
- b. Framing:
 - i. Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
 - (A) Construction: Thermally broken.
 - (B) Vertical Mullion Face Width: 2-1/2 inches.
 - (C) Vertical Mullion Depth from Face of Flat Glazing Cap to Back of Frame: 7-1/2 inches nominal.
 - (D) Glazing System: Retained mechanically with gaskets on four sides.
 - (E) Glazing Plane: As indicated on Contract Documents and Specifications.
 - (F) Finish: Clear anodic finish.
 - (G) Fabrication Method: Either factory- or field-fabricated system.
 - ii. Infill Panels: Insulated, aluminum sheet face and back, with edges formed to fit glazing channel and sealed.
 - (A) Face Sheet: 0.019-inch thick, minimum.
 - (B) Core: Rigid polyurethane insulation core with R-value of 6.
 - (C) Back Sheet: 0.019-inch thick, minimum.
 - (D) Exterior Finish: Class I natural anodized.
 - (E) Interior Finish: Clear anodized.
 - iii. Pressure Caps:
 - (A) Manufacturer's standard aluminum components that mechanically retain glazing.
 - (B) Include snap-on aluminum trim that conceals fasteners.
 - iv. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
 - v. Materials:
 - (A) Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

- (1) Sheet and Plate: ASTM B 209.
 - (2) Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
 - (3) Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
 - (4) Structural Profiles: ASTM B 308/B 308M.
 - (B) Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.
 - (1) Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
 - (2) Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
 - (3) Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.
- vi. Entrance Door Systems:
- (A) Manufacturer's standard glazed entrance doors for manual-swing operation.
 - (B) Door Design:
 - (1) Configuration: As indicated on Contract Documents and Specifications.
 - (2) Profile: Wide stile.
 - (3) Thickness: 2.25 inches.
 - (4) Material Thickness: 0.1875 inches
 - (5) Top Rail: 5 inches wide.
 - (6) Vertical Stiles: 5 inches wide.
 - (7) Bottom Rail: 10 inches wide.
 - (8) Glazing Stops and Gaskets: Beveled, snap-on, extruded-aluminum stops and preformed gaskets.
 - (9) Finish: Same as Curtain-Wall.
 - (10) Construction: Internally welded stile and rail joints.
 - (11) Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.

7. Tubular Skylights:

- a. Transparent roof-mounted skylight dome and self-flashing curb, reflective tube, and ceiling level diffuser assembly, transferring sunlight to interior spaces; complying with ICC AC-16.
 - i. Transparent, UV and impact resistant dome with flashing base supporting dome and top of tube.
 - ii. Glazing: Type DA, 0.143-inch minimum thickness injection molded acrylic classified as CC2 material; UV inhibiting (100 percent UV C, 100 percent UV B and 98.5 percent UV A), impact modified acrylic blend.
 - iii. LightTracker Reflector, made of aluminum sheet, thickness 0.015 inch with Spectralight Infinity. Positioned in the dome to capture low angle sunlight.
 - iv. Diffuser Assemblies attached directly to bottom of tube:
 - (A) Lens: Type L1 OptiView Fresnel lens design to maximize light output and diffusion. Visible Light Transmission shall be greater than 90 percent at 0.022 inch thick. Classified as CC2.
 - (B) Lens: Type L2, Prismatic lens designed to maximize light output and diffusion. Visible Light Transmission shall be greater than 90 percent at 0.100 inch thick. Classified as CC2.
 - (C) Diffuser Seal: Open cell foam, acrylic adhesive backed, 0.75-inch wide by 0.125-inch thick to minimize condensation and bug, dirt and air infiltration per ASTM E 283.
 - (D) Diffuser Trim Ring: Injection molded acrylic. Nominal wall thickness 0.172 inches.
 - (E) Secondary Diffuser: Type SS, Acrylic plastic classified as CC2 material. Thickness shall not be less than 0.100 inches.
 - (F) Daylight Dimmer: Electro-mechanically actuated daylight valve: for universal input voltages ranging between 90 and 277V at 50 or 60 Hz: actuator rated at 0.1 amp per unit: controlled by low voltage, series circuited, 4 conductor, size 22 cable, and low voltage DC DP/DT switch: providing daylight output between 2 and 100 percent.
 - (1) Provide concealed, plenum-rated dimmer control device so no wiring is exposed to view.
 - (2) Locations: As shown on the Contract Documents and Specifications.
- b. Water Penetration under Static Pressure: Provide panel assemblies that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-

pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. 10 lbf/sq. ft. 15 lbf/sq. ft.

- c. Thermal Movements:
 - i. Allow for thermal movements from ambient- and surface-temperature changes.
 - ii. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - iii. Temperature Change (Range): 0 - 120 deg F, ambient; 180 deg F, material surfaces.
- d. Energy Performance: Provide panel assemblies with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below and certified and labeled according to NFRC:
 - i. Thermal Transmittance (U-Factor): Skylights shall have a U-Factor of not more than U-0.50 Btu/sq. ft. x h x deg F.
 - ii. Solar Heat Gain Coefficient (SHGC): Skylights shall have a SHGC of no greater than 0.40.
- e. Air Infiltration: Maximum air leakage through fixed glazing and framing areas of 0.30 cfm/sq. ft. (1.50 L/s per sq. m) of fixed wall area as determined according to ASTM E 283 at a minimum static-air-pressure differential of 1.57 lbf/sq. ft.
- f. Uniform Load Test:
 - i. No breakage, permanent damage to fasteners, hardware parts, or damage to make daylighting system inoperable or cause excessive permanent deflection of any section when tested at a Positive Load of 150 psf (7.18 kPa) or Negative Load of 70 psf (3.35 kPa).
 - ii. All units shall be tested with a safety factor of (3) for positive pressure and (2) for negative pressure, acting normal to plane of roof in accordance with ASTM E 330.
- g. Fire Testing:
 - i. When used with the Dome Edge Protection Band, all domes meet fire rating requirements as described in the 2006 International Building Code.
 - ii. Self-Ignition Temperature - Greater than 650 degrees F per ASTM D-1929.
 - iii. Smoke Density - Rating no greater than 450 per ASTM Standard E 84 in way intended for use. Classification C.
 - iv. Rate of Burn and/or Extent - Maximum Burning Rate: 2.5 inches/min (62 mm/min) Classification CC-2 per ASTM D 635.
 - v. Rate of Burn and/or Extent - Maximum Burn Extent: 1 inch, Classification CC-1 per ASTM D 635.

8. Glazing:

- a. Performance:
- i. Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
 - ii. Structural Performance:
 - (A) Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E 1300.
 - (B) Design Wind Pressures: As indicated on the Contract Documents and Specifications.
 - iii. Design Wind Pressures: Determine design wind pressures applicable to Project according to ASCE/SEI 7, based on heights above grade indicated on the Contract Documents and Specifications.
 - (A) Wind Design Data: As indicated on the Contract Documents and Specifications.
 - (B) Basic Wind Speed: As indicated on the Contract Documents and Specifications.
 - (C) Importance Factor: As indicated on the Contract Documents and Specifications.
 - (D) Exposure Category: As indicated on the Contract Documents and Specifications.
 - iv. Design Snow Loads: As indicated on the Contract Documents and Specifications.
 - v. Thickness of Patterned Glass: Base design of patterned glass on thickness at thinnest part of the glass.
 - vi. Probability of Breakage for Sloped Glazing: For glass surfaces sloped more than 15 degrees from vertical, design glass for a probability of breakage not greater than 0.001.
 - vii. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.
 - viii. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
 - ix. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

- (A) For monolithic-glass lites, properties are based on units with lites 6 mm thick.
 - (B) For laminated-glass lites, properties are based on products of construction indicated.
 - (C) For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
 - (D) U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
 - (E) Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
 - (F) Visible Reflectance: Center-of-glazing values, according to NFRC 300.
- b. Glass Products:
- i. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.
 - ii. Fully Tempered Float Glass:
 - (A) ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
 - (B) Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
 - iii. Heat-Strengthened Float Glass:
 - (A) ASTM C 1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
 - (B) Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
 - iv. Laminated Glass: ASTM C 1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
 - (A) Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written instructions.
 - (B) Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
 - (C) Interlayer Color: Clear unless otherwise indicated.

- (D) Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
 - (E) Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
 - v. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.
 - (A) Sealing System: Dual seal, with manufacturer's standard primary and secondary sealants.
 - (B) Spacer: Manufacturer's standard spacer material and construction.
 - (C) Desiccant: Molecular sieve or silica gel, or a blend of both.
 - (D) Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.
- c. Glazing Sealants and Tapes:
 - i. Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 - ii. Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 - iii. Field-applied sealants shall have a VOC content of not more than 250 g/L.
 - iv. Colors of Exposed Glazing Sealants: As selected by consultant from manufacturer's full range.
 - v. Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.
 - vi. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
 - (A) AAMA 804.3 tape, where indicated.

- (B) AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 - (C) AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
 - vii. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
 - (A) AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
 - (B) AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.
- 9. Door Hardware:
 - a. Conduct Keying Conference: Conduct conference at Project site that shall include:
 - i. Attendees: District 20, contractor, architect, installer, and supplier's architectural Hardware Consultant.
 - ii. Decisions into final keying schedule after reviewing door hardware keying system including:
 - (A) Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
 - (B) Preliminary key system schematic diagram.
 - (C) Requirements for key control system.
 - (D) Requirements for access control.
 - (E) Address for delivery of keys.
 - b. Districts Keying Vendor: Colorado State Safe and Lock.
 - c. Components:
 - i. Keying:
 - (A) New Construction: Everest 29 Keyway, Large Format, T124.
 - (B) Existing Construction: Match current Schlage coring and keying system. Verify with District Facilities.
 - ii. Door handles - Interior:
 - (A) Schlage:
 - (1) ND Series.
 - (2) Rhodes style handle – Satin Chromium Plated.
 - (3) IC Cores. Grade 1 cylinder locks.
 - (B) Provide one maintenance kit per site.

- (C) Use 626 Finish as standard unless matching existing finish. 990NL latch used where doors are for exit only.
- iii. Mortise Locks:
 - (A) Schlage – L9000 Series.
 - (B) Install only with District 20's approval.
- iv. Panic Hardware:
 - (A) Von Duprin:
 - (1) 35 Series – Narrow Stile.
 - (2) 98 Series – Wide Stile.
 - (3) Vertical Rods shall be exposed. Concealed rods are prohibited.
 - (4) Keyed dog-down function.
 - (B) Provide one maintenance kit per site.
- v. Door Closers:
 - (A) Mechanical:
 - (1) LCN: 4040XP.
 - (a) Metal cover.
 - (B) Electronic – Automatic:
 - (1) Horton: EZ Swing 7000.
 - (a) Wireless pressure plates.
 - (b) Dedicated electrical circuit.
 - (i) Place on e-circuit if available.
 - (c) Integrate with buildings access control system.
 - (2) Pneumatic devices are prohibited.
- vi. Hinges:
 - (A) Full Mortise:
 - (1) Stanley – 5 Knuckle Full Mortise - Heavy Weight.
 - (2) Or approved equal.
 - (B) Continuous:
 - (1) Pemko.
 - (2) Install only with District 20's approval.
- vii. Mullions:
 - (A) Von Duprin: KR 9954.
 - (1) Provide 154 stabilizer kit.
 - (2) Steel mullions shall be removable and keyed.

(3) Coordinate with access controls wiring.

viii. Kick-plates:

(A) 10 inches (254 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs.

EXECUTION

- A. Installations shall be in strict accordance with manufactures requirements.
- B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.
- C. Adjusting and Cleaning:
 - 1. Operation: Rehang or replace doors that do not swing or operate freely.
 - 2. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.
 - 3. Remove grout and other bonding material from hollow-metal work immediately after installation.
 - 4. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
 - 5. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.
 - 6. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in the Contract Documents and Specifications.

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Division 09 – Finishes

GENERAL

- A. Drywall and joint finishing systems manufactured and labeled “Made in China” is not permitted.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in Contract Documents and Specifications with minimum five years documented experience.
- C. Source Limitations: Obtain materials from single source from single manufacturer.
- D. Installers Qualifications: Company specializing in installing products as specified the in Contract Documents and Specifications with a minimum of five years documented experience.
- E. Submittals:
 - 1. Provide data on gypsum board, backing boards, wallboard, accessories, and joint finishing systems.
 - 2. Provide manufacturer's data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.
 - a. Full-sized units of each type and composition of tile and for each color and finish specified. For ceramic mosaic tile in color blend patterns, provide one full sheet of each specified color blend.
 - b. Include samples of specified accessories requiring color selection.
 - c. Submit manufacturer's color samples of available grout consisting of actual sections of grout showing full range of colors available for each type of grout specified.
 - 3. Acoustical Panels: Set of 6-inch- square Samples of each type, color, pattern, and texture.
 - 4. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch- long Samples of each type, finish, and color.
 - 5. Wood Strip and Plank Flooring:
 - a. Provide data for flooring, floor finish materials, cushion blocks, and game insert or socket devices.
 - b. Shop Drawings:
 - i. Indicate floor joint pattern and termination details.
 - ii. Indicate provisions for expansion and contraction, base, base corner details, and game insert or socket devices.
 - iii. Indicate location, size, design, and color of game markings.
 - c. Samples: Submit two samples 12 x 12 inch in size illustrating floor finish, color, and sheen.

- d. Installation Instructions: Indicate standard and special installation procedures.
 - e. Maintenance Data: Include maintenance procedures.
 - f. Source Quality Control: Inspect and stamp species and grade on underside of each piece of wood flooring at factory.
6. Wood Stage Flooring:
- a. Provide data for flooring.
 - b. Shop Drawings:
 - i. Indicate floor joint pattern and termination details.
 - ii. Indicate provisions for expansion and contraction.
 - c. Samples: Submit two samples 12 x 12 inch in size illustrating floor finish, color, and sheen.
 - d. Maintenance Data: Include maintenance procedures.
 - e. Source Quality Control: Inspect and stamp species and grade on underside of each piece of wood flooring at factory.
7. Resilient Flooring, Base and Accessories:
- i. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
 - ii. Verification Samples: Submit two samples, 6 by 6 inch in size illustrating color and pattern for each resilient flooring product specified.
 - iii. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of sub-floor is acceptable.
 - iv. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.
8. Carpet:
- a. Shop Drawings: Indicate seaming plan, method of joining seams, direction of carpet pile and pattern, location of edge moldings and edge bindings, and other installation features.
 - b. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
 - c. Samples: Submit two samples 24 by 24 inch in size illustrating color and pattern for each carpet and cushion material specified.

- d. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
9. Exterior Painting:
- a. Provide complete list of products to be used, with the following information for each:
 - i. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - ii. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
 - iii. Manufacturer's installation instructions.
 - b. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
 - i. Where sheen is specified, submit samples in only that sheen.
 - ii. Where sheen is not specified, submit each color in each sheen available.
 - iii. Allow 14 days for approval process, after receipt of complete samples by consultant.
10. Interior Painting:
- a. Provide complete list of products to be used, with the following information for each:
 - i. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - ii. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
 - iii. Manufacturer's installation instructions.
 - b. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
 - c. Where sheen is specified, submit samples in only that sheen.
 - d. Where sheen is not specified, submit each color in each sheen available.
 - e. Allow 14 days for approval process, after receipt of complete samples by consultant.
- F. Warranty:
- 1. Gypsum Assemblies:

- a. Correct defective work and materials within a two-year period after Date of Substantial Completion.
2. Ceramic Tiling:
 - a. Correct defective work and materials within a two-year period after Date of Substantial Completion.
 - b. Manufactures standard warranty.
3. Acoustical Ceiling Panels and Grid:
 - a. Correct defective work and materials within a two-year period after Date of Substantial Completion.
 - b. Manufactures standard warranty.
4. Wood Striping and Plank Flooring:
 - a. Correct defective work and materials within a two-year period after Date of Substantial Completion.
 - b. Manufactures standard warranty.
5. Wood Stage Flooring:
 - a. Correct defective work and materials within a two-year period after Date of Substantial Completion.
 - b. Manufactures standard warranty.
6. Resilient Flooring, Base and Accessories:
 - a. Correct defective work and materials within a two-year period after Date of Substantial Completion.
 - b. Manufactures standard warranty.
7. Carpet:
 - a. Correct defective work and materials within a two-year period after Date of Substantial Completion.
 - b. Manufactures standard warranty.
8. Exterior Painting:
 - a. Correct defective work and materials within a two-year period after Date of Substantial Completion.
 - b. Manufactures standard warranty.
9. Interior Painting:
 - a. Correct defective work and materials within a two-year period after Date of Substantial Completion.
 - b. Manufactures standard warranty.

PRODUCTS**A. Gypsum Board:**

1. Gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
 - a. Applications: Use for vertical surfaces and ceilings, unless otherwise indicated.
 - b. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
 - c. Thickness: As indicated on Contract Documents and Specifications.
 - i. Vertical Surfaces: 5/8 inch.
 - ii. Ceilings: 5/8 inch.
 - iii. Multi-Layer Assemblies: Thicknesses as indicated on Contract Documents and Specifications.
2. Impact-Resistant Wallboard:
 - a. Applications: High-traffic areas indicated.
 - b. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - c. Paper-Faced Type: Gypsum wallboard as defined in ASTM C1396/C1396M.
 - d. Type: Fire resistance rated Type X, UL or WH listed.
 - e. Thickness: 5/8 inch.
 - f. Edges: Tapered.
3. Backing Board for Wet Areas:
 - a. Applications: Surfaces behind tile in wet areas including tub and shower surrounds, shower ceilings, and toilet rooms.
 - b. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - c. ANSI Cement-Based Backing Board: Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.
 - i. Thickness: 1/2 inch.
 - d. ASTM Cement-Based Backing Board: Non-gypsum-based, cementitious board complying with ASTM C1288.
 - i. Thickness: 1/2 inch.

- e. Glass-Mat-Faced Backing Board: Coated glass mat water-resistant gypsum backing panel as defined in ASTM C1178/C1178M.
 - i. Standard Type Thickness: 1/2 inch.
 - ii. Fire Resistant Type Thickness: Type X core, 5/8 inch.
- 4. Backing Board for Non-Wet Areas:
 - a. Water-resistant gypsum backing board as defined in ASTM C1396/C1396M; sizes to minimum joints in place; ends square cut.
 - b. Applications: Ceilings and vertical surfaces in "wet" areas but not behind thinset tile.
 - c. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - d. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
 - e. Type: Regular and Type X, in locations indicated.
 - f. Type X Thickness: 5/8 inch.
 - g. Thickness: As indicated on Contract Documents and Specifications.
 - h. Edges: Tapered.
- 5. Shaftwall and Coreboard:
 - a. Type X: 1 inch thick by 24 inches wide, beveled long edges, ends square cut.
 - b. Paper Faced Type: Gypsum shaftliner board or gypsum coreboard as defined ASTM C1396/C1396M; water-resistant faces.
- B. Ceramic Tiling:
 - a. Glazed Wall Tile:
 - i. ANSI A137.1, standard grade.
 - ii. Moisture Absorption: 7.0 to 20.0 percent as tested in accordance with ASTM C373.
 - iii. Size and Shape: As Scheduled on Contract Documents and Specifications.
 - iv. Edges: Cushioned.
 - v. Surface Finish: Matte glaze.
 - vi. Color(s): As scheduled.
 - vii. Trim Units: Matching bead, bullnose, cove, and base shapes in sizes coordinated with field tile.

- b. Porcelain Floor Tile:
 - i. ANSI A137.1, standard grade.
 - ii. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
 - iii. Size and Shape: As Scheduled on Contract Documents and Specifications.
 - iv. Thickness: 3/8 inch.
 - v. Edges: Cushioned.
 - vi. Surface Finish: Matte glazed.
 - vii. Color(s): As scheduled.
 - viii. Trim Units: Matching bullnose, double bullnose, cove base, and cove shapes in sizes coordinated with field tile.
- c. Porcelain Ceramic Stair Treads and Risers:
 - i. Match flooring for surface finish and color; free of defects detrimental to appearance or durability.
 - ii. Unit Size: As Scheduled on Contract Documents and Specifications.
 - iii. Thickness: 3/8 inches.
 - iv. Top edge corners beveled.
 - v. Riser Height: As Scheduled on Contract Documents and Specifications.
 - vi. Stair Nosings:
 - (A) Description: roll-formed stainless steel (type 304 = V2A) profile with ribbed, 1-3/16 inch (30 mm) wide exposed surface with rounded leading edge, and integrated trapezoid-perforated anchoring leg.
 - (B) Material and Finish:
 - (1) E - Stainless Steel Type 304 = V2A.
- d. Waterproof Membrane:
 - i. Manufacturer's standard product that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
 - ii. Fluid-Applied Membrane: Liquid-latex rubber or elastomeric polymer.

- iii. Locations: Under floor tile in food service and shower areas, and in toilet rooms.
 - e. Crack Isolation Membrane:
 - i. Manufacturer's standard product that complies with ANSI A118.12 for standard performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
 - ii. Fluid-Applied Membrane: Liquid-latex rubber or elastomeric polymer.
 - iii. Locations: Under floor tile at concrete control joints and floor cracks.
- C. Suspended Acoustical Ceilings:
 - 1. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: Class A according to ASTM E 1264.
 - b. Smoke-Developed Index: 50 or less.
 - 2. Antimicrobial Treatment: Manufacturer's standard broad spectrum, antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273, ASTM D 3274, or ASTM G 21 and evaluated according to ASTM D 3274 or ASTM G 21.
 - 3. Acoustical Panel Standard: Provide manufacturer's standard panels according to ASTM E 1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.
 - 4. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C 635/C 635M and designated by type, structural classification, and finish indicated.
 - a. High-Humidity Finish: Where indicated, provide coating tested and classified for "severe environment performance" according to ASTM C 635/C 635M.
 - 5. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized, G30 coating designation; with prefinished 15/16-inch- wide metal caps on flanges.
 - a. Structural Classification: Intermediate-duty system.
 - b. Face Design: Flat, flush.
 - c. Cap Material: Cold-rolled steel.

- d. Cap Finish: As shown on the Contract Documents and Specifications.
- 6. Wide-Face, Aluminum-Capped, Double-Web, Hot-Dip Galvanized, G60, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; hot-dip galvanized, G60 coating designation; with prefinished, 15/16-inch-wide aluminum caps on flanges.
 - a. Structural Classification: Intermediate-duty system.
 - b. Face Design: Flat, flush.
 - c. Cap Finish: As shown on the Contract Documents and Specifications.
- D. Wood Strip and Plank Flooring:
 - 1. Wood Strip Flooring - Gymnasium: Robbins - Eclipse - Anchored System.
 - a. Total System Height: 2-1/8" thick flooring system. Recess concrete slab to match manufacturer's recommendations.
 - b. Species: Northern Hard Maple, Continuous Strip XL Finger-Jointed (FJ).
 - c. Grade: Second and better.
 - d. Cut: Edge grain.
 - e. Moisture Content: 7 to 9 percent.
 - f. Actual Thickness: 25/32 inch.
 - g. Actual Width: 2-1/4 inches.
 - h. Edge: Square.
 - i. Edge: Tongue and groove.
 - j. End: Square, end matched.
 - k. Backs: Channeled (kerfed) for stress relief.
 - l. Length: Random; minimum length complying with specified grade.
 - m. Flooring Nails: Type recommended by flooring manufacturer.
 - n. Sleepers and Shims: Softwood lumber, pressure treated for moisture protection, 2 by 4-inch size.
 - o. Subflooring: As recommended by flooring manufacturer.
 - p. Secondary Subflooring: 23/32-inch thick plywood, with tongue and groove edges; Exposure 1, sanded, preservative treated.
 - q. Vapor Retarder: Black polyethylene sheet, 8 mil thick; 2-inch wide tape for joint sealing.
 - 2. Accessories:
 - a. Ventilating Base: Molded rubber, 4-inch high with a 3-inch toe, ventilating type, with adhesives and accessories, black.

- b. Cushion Blocks: Resilient pads, rubber material, sealed air channels for resiliency; compressible to 1/16 inch under a 40 psi load with full and immediate recovery.
- c. Transition Strip: Same species and finish as flooring material; profiles indicated.
- d. Game Insert Devices: As shown on the Contract Documents and Specifications.
- e. Floor Finish: Water borne urethane, to achieve high gloss surface; type recommended by flooring manufacturer.
- f. Marking Paint: Gameline paints shall be recommended by the finishing materials manufacturer and shall be compatible with the finish.
- g. Sealer and Wax: Types recommended by flooring manufacturer.

E. Wood Stage Flooring:

1. Wood Strip Flooring - Stage Floor Area:

- a. Species: White Hard Maple. Review species with District 20 if matching existing conditions.
- b. Grade: Third and better.
- c. Cut: Flat grain.
- d. Moisture Content: 7 to 9 percent.
- e. Actual Thickness: 25/32 inch.
- f. Actual Width: 2-1/4 inches.
- g. Edge: Tongue and Groove.
- h. End: End matched.
- i. Length: Random, minimum length complying with specified grade.
- j. Surface Panels: Olympic Panel, Tempered Plyron: 3/4" Thick Tempered Hardboard Faced Plywood Panel over 1 layer of 23/32-inch thick plywood (basket weave) over 1x sleepers at 16"
- k. Actual depth: 2-1/2 inches.
- l. Flooring Nails: Type recommended by flooring manufacturer.
- m. Sleepers and Shims: Softwood lumber, pressure treated for moisture protection, 2 x 4-inch size.
- n. Secondary Subflooring: 23/32-inch thick plywood, with tongue and groove edges; Exposure 1, sanded, preservative treated.

2. Accessories:

- a. Ventilating Base: Molded rubber, 4-inch high with a 1-inch toe, ventilating type, with adhesives and accessories, color as selected.

- b. Transition Strip: Same species and finish as flooring material; profiles indicated.
 - c. Floor Finish:
 - i. WD-2: Polyurethane, to achieve high gloss surface; type recommended by flooring manufacturer.
 - ii. WD-3: Paint Flat Black.
 - d. Sealer and Wax: Types recommended by flooring manufacturer.
- F. Resilient Flooring, Base and Accessories:
- 1. Low-Emitting Materials: Flooring system and accessories shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 2. Luxury Vinyl Tile (LVT) - Plank:
 - a. Solid vinyl with color and pattern throughout thickness.
 - b. Minimum Requirements: Comply with ASTM F1700, of Class corresponding to type specified.
 - c. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
 - d. Mold and Microbial Resistance: Highly resistant when tested in accordance with ASTM D6329; certified in accordance with UL 2824.
 - e. Plank Size: 6 by 48 inch.
 - f. Total Thickness: 0.120 inch.
 - g. Wear Layer: 40 mil – minimum.
 - 3. Resilient Athletic Flooring:
 - a. Sheet Vinyl Flooring with Backing: ASTM F 1303.
 - i. Wear-Layer Thickness: Grade 1.
 - ii. Overall Thickness: 5.0 mm.
 - iii. Interlayer Material: Foamed plastic, high density closed-cell PVC.
 - iv. Anti-fungal Treatment: Manufacturer's standard.
 - b. Seaming Method: Heat welded.
 - c. Traffic-Surface Texture: Smooth.
 - d. Applied Finish: Factory-applied UV urethane.
 - e. Roll Size: Not less than 48 inches wide by longest length that is practical to minimize splicing during installation.

- f. Trowelable Leveling and Patching Compound: Latex-modified, hydraulic-cement-based formulation approved by flooring manufacturer.
- g. Adhesives: Water-resistant type recommended in writing by manufacturer for substrate and conditions indicated.
 - i. Adhesives shall comply with 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."
- h. Game-Line and Marker Paint: Complete system including primer, if any, compatible with flooring and recommended in writing by flooring and paint manufacturers for use indicated.
 - i. Paint shall comply with 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."

G. Stairs

1. Stair Treads:

- a. Rubber; raised round; full width and depth of stair tread in one piece; tapered thickness; nosing not less than 1-5/8 inch deep.
- b. Minimum Requirements: Comply with ASTM F2169, Type TS, rubber, vulcanized thermoset.
- c. Nominal Thickness: 0.1875 inch.
- d. Hardness rating shall not be less than 85 Shore A.
- e. Nosing: Square.
- f. Manufacturer by Johnsonite or Tarkett.

2. Stair Risers:

- a. Full height and width of tread in one piece, matching treads in material and color.
- b. Thickness: 0.080 inch.

3. Stair Stringers:

- a. Full height in one piece and in maximum available lengths, matching treads in material and color.
- b. Thickness: 0.125 inch.

4. Stair Nosings:

- a. Aluminum profile which supports a slip-resistant thermoplastic rubber wear surface with rounded leading edge, and anchor leg for setting in concrete pan.
- 5. Resilient Base:
 - a. ASTM F1861, Type TS rubber, vulcanized thermoset; top set Style B, Cove.
 - b. Height:
 - i. New Construction: 4 or 6 inch.
 - ii. Renovations: 4.5 or 6 inch.
 - c. Thickness: 0.125 inch thick.
 - d. Finish: Satin.
 - e. Length: Roll

H. Carpet:

- 1. Carpet shall be vinyl cushion back carpeting conforming to the following:
 - a. Type: Textured loop with adhesive already on back of carpet.
 - b. Width: 6' minimum width.
 - c. Gauge: 0.117 minimum.
 - d. Backing: Closed cell.
 - e. Dye Method: 80% solution dyed/20% yarn dyed.
 - f. Flame Spread: Class A, passes DOC FF 1-70 or CPSC FF 1-70
 - g. Adhesive: As recommended by Manufacturer - Glue-Down.
- 2. Seams shall be chemically welded.
- 3. Carpet edge strips shall be rubber
- 4. Carpeting is not permitted on stairs

I. Exterior Paint:

- 1. Paints and Finishes: Ready mixed, unless required to be a field-catalyzed paint.
 - a. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - b. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 - c. Supply each paint material in quantity required to complete entire project's work from a single production run.

- d. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
 - e. Volatile Organic Compound (VOC) Content: Low VOC.
 - f. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by consultant from the manufacturer's full line.
 - g. Colors:
 - i. To be selected from manufacturer's full range of available colors.
 - ii. Allow for minimum of three colors for each system, unless otherwise indicated, without additional cost to District 20.
 - iii. Extend colors to surface edges; colors may change at any edge as directed by consultant or District Project Manager.
2. Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including primed metal.
- a. Two topcoats and one coat primer.
 - b. Topcoat(s): Exterior Ferrous Metals, Primed, Latex, 2-coat.
 - c. Touch-up with rust-inhibitive primer recommended by topcoat manufacturer.
 - d. Semi-gloss: Two coats of DTM Acrylic enamel.
 - i. Acceptable Product: Sherwin-Williams DTM Acrylic.
3. Ferrous Metals, Unprimed, Latex, 3 Coat:
- a. One coat of latex primer.
 - i. Primer: Sherwin-Williams Pro Industrial Pro-Cryl Universal Metal Primer, B66-310 Series.
 - b. Semi-gloss:
 - i. Two coats of DTM Acrylic enamel.
 - ii. Topcoat(s): Sherwin-Williams DTM Acrylic.
4. Galvanized Metals, Latex, 3 Coat:
- a. One coat galvanize primer.
 - b. Semi-gloss: Two coats of DTM acrylic enamel.
- J. Interior Painting:
- 1. Paints and Finishes: Ready mixed, unless required to be a field-catalyzed paint.

- a. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - b. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 - c. Supply each paint material in quantity required to complete entire project's work from a single production run.
 - d. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
2. Volatile Organic Compound (VOC) Content: Low VOC
3. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by consultant from the manufacturer's full line.
4. Colors:
 - a. To be selected from manufacturer's full range of available colors.
 - b. Allow for minimum of three colors for each system, unless otherwise indicated, without additional cost to District 20.
 - c. Extend colors to surface edges; colors may change at any edge as directed by consultant or District Project Manager.
 - d. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling they are mounted on/under.
 - e. In utility areas, finish equipment, piping, conduit, and exposed duct work in colors according to the same color as the walls/ceilings they are mounted on/under.
5. Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, concrete masonry units, and uncoated steel.
 - a. Two topcoats and one coat primer.
 - b. Topcoat(s): Institutional Low odor/VOC Interior Latex.
 - i. Acceptable Products:
 - (A) Sherwin-Williams ProMar 200 Zero VOC Interior Latex, Satin.
 - (B) Sherwin-Williams 100% Acrylic Interior Latex, Semi-Gloss.
 - c. Primer: As recommended by topcoat manufacturer for specific substrate.

6. Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals:
 - a. Medium duty applications include metal doors, door frames, railings, handrails, guardrails, and balustrades.
 - b. Two topcoats and one coat primer.
 - c. Topcoat(s): Interior Alkyd, Water Based.
 - i. Acceptable Products:
 - (A) Sherwin-Williams ProMar 200 Water-based Acrylic-Alkyd, Semi-Gloss.
7. Medium Duty vertical: Including gypsum board.
 - a. Two topcoats and one coat primer.
 - b. Topcoat(s): High Performance architectural Interior Latex.
 - i. Acceptable Products:
 - (A) Sherwin-Williams Pro Industrial Pre-Catalyzed Water-based Epoxy, Semi-Gloss.
8. Dry Fall: Metals; exposed structure and overhead-mounted services, including shop primed steel deck, structural steel, metal fabrications, galvanized ducts, galvanized conduit, and galvanized piping.
 - a. Shop primer by others.
 - b. Two topcoats.
 - c. Topcoat: Latex Dry Fall.
 - i. Acceptable Products:
 - (A) PPG Paints Speedhide Super Tech Water Based Interior Dry-Fog, 6-724XI, Semi-Gloss.
9. Transparent Finish on Concrete Floors.
 - a. 2 coats sealer.
 - b. Sealer: Water Based for Concrete Floors.
 - i. Acceptable Products:
 - (A) Behr Premium Wet-Look Sealer High Gloss [No. 985] (MPI #99).
 - (B) PPG Paints Perma-Crete Plex-Seal WB Interior/Exterior Clear Sealer Stain, 4-6200 (MPI #99).
10. Concrete/Masonry, opaque, Latex, 3 Coat:
 - a. One coat of block filler.
 - b. Semi-gloss: Two coats of latex enamel.

- c. At Kitchen, Gym, Locker Rooms and Restrooms: Two coats of epoxy paint.
- 11. Ferrous Metals, Unprimed, Latex, 3 Coat:
 - a. One coat of latex primer.
 - b. Semi-gloss: Two coats of latex enamel.
- 12. Ferrous Metals, Primed, Latex, 2 Coat:
 - a. Touch-up with latex primer.
 - b. Semi-gloss: Two coats of latex enamel.
- 13. Galvanized Metals, Latex, 3 Coat:
 - a. One coat galvanize primer.
 - b. Semi-gloss: Two coats of latex enamel.
- 14. Gypsum Board/Plaster, Latex-Acrylic, 3 Coat:
 - a. One coat of alkyd primer sealer.
 - b. Satin: Two coats of latex-acrylic enamel.

EXECUTION

- A. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - 2. Level 2: Panels that are substrate for tile.
 - 3. Level 3: Where indicated on Contract Documents and Specifications.
 - 4. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in the Contract Documents and Specifications.
 - 5. Level 5: At Dry Erase Coating locations, and where indicated on Drawings.
- B. Ceramic Tiling:
 - 1. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.
 - 2. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.
 - 3. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of setting materials to sub-floor surfaces.
 - 4. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within the following limits:

- a. Moisture Emission Rate: Not greater than 3 lb. per 1000 sq. ft per 24 hours, test in accordance with ASTM F1869.
 - b. Alkalinity (pH): Verify pH range of 5 to 9, test in accordance with ASTM F710.
 5. Verify that required floor-mounted utilities are in correct location.
 6. Seal all tile once grout has fully cured.
 7. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
 8. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- C. Acoustic Panel Ceiling:
1. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weather tight, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
 - a. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.
 2. Install acoustical panel ceilings according to ASTM C 636/C 636M and manufacturer's written instructions.
- D. Wood Strip and Plank Flooring:
1. Do not install wood flooring until wet construction work is complete and ambient air at installation space has moisture content stabilized at maximum moisture content of 40 percent.
 2. Provide heat, light, and ventilation prior to installation.
 3. Store materials in area of installation for minimum period of 24 hours prior to installation.
 4. Maintain minimum room temperature of 65 degrees F for a period of two days prior to delivery of materials to installation space, during installation, and after installation.
 5. Verify that concrete subfloor surface is smooth and flat to plus or minus 1/4 inch in 10 feet.
 6. Verify wood subfloor is properly secured, smooth and flat to plus or minus 1/4 inch in 10 feet.
 7. Verify that required floor-mounted utilities are in correct location.

8. Verify Moisture content of the concrete slab shall not exceed 4% or vapor transmission exceeds 4.5 pounds per 1,000 square feet (2.20 kg per 100 square meters).
9. Clean and polish floor surfaces in accordance with floor finish manufacturer's instructions.
10. Prohibit traffic on floor finish for 48 hours after installation.
11. Place protective coverings over finished floors; do not remove coverings until Substantial Completion.

E. Wood Stage Flooring:

1. Do not install wood flooring until wet construction work is complete and ambient air at installation space has moisture content stabilized at maximum moisture content recommended by manufacturer.
2. Provide heat, light, and ventilation prior to installation.
3. Store materials in area of installation for minimum period of 24 hours prior to installation.
4. Maintain minimum room temperature of 65 degrees F for a period of two days prior to delivery of materials to installation space, during installation, and after installation.

F. Resilient Flooring, Base and Accessories:

1. Install in accordance with manufacturer's instructions.
2. Store materials for not less than 48 hours prior to installation in area of installation at a minimum temperature of 65 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.
3. Install resilient flooring and accessories after other finishing operations, including painting have been completed.
4. Do not install resilient flooring over concrete slabs until slabs have been fully cured and are sufficiently dry to achieve proper bond with adhesive as determined by resilient flooring manufacturer's recommended bond and moisture test.
5. Prohibit traffic on resilient flooring for 48 hours after installation.

G. Carpet:

1. Stage materials in area of installation for minimum period of 24 hours prior to installation.
2. Maintain minimum 70 degrees F ambient temperature 24 hours prior to, during and 24 hours after installation.
3. Ventilate installation area during installation and for 72 hours after installation.

4. Do not commence with carpet installation until painting and finishing work is complete and ceilings and overhead work has been tested, approved, and completed.
5. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive carpet.
6. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of adhesives to sub floor surfaces.
7. Verify that concrete sub-floor surfaces are ready for flooring installation by testing for moisture emission rate and alkalinity according to ASTM F 2170; obtain instructions if test results are not within the following limits:
 - a. Moisture Emission Rate: Not greater than 3 lb. per 1000 sq. ft per 24 hours when tested using calcium chloride moisture test kit for 72 hours.
 - b. Alkalinity: pH range of 5-9.
8. Verify that required floor-mounted utilities are in correct location.

H. Exterior Painting:

1. Do not begin application of paints and finishes until substrates have been properly prepared.
2. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
3. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
4. Test shop-applied primer for compatibility with subsequent cover materials.
5. Clean surfaces thoroughly and correct defects prior to application.
6. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
7. Remove or repair existing paints or finishes that exhibit surface defects.
8. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.
9. Seal surfaces that might cause bleed through or staining of topcoat.
10. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
11. Do Not Paint or Finish the Following Items:
 - a. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - b. Items indicated to receive other finishes.

- c. Items indicated to remain unfinished.
 - i. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
 - d. Floors, unless specifically indicated.
 - e. Brick, architectural concrete, cast stone, integrally colored plaster and stucco.
 - f. Glass.
 - g. Concrete masonry units in utility, mechanical, and electrical spaces.
 - h. Acoustical materials, unless specifically indicated.
 - i. Concealed pipes, ducts, and conduits.
- 12. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.
 - 13. Protect finishes until completion of project.
 - 14. Touch-up damaged finishes after Substantial Completion.

I. Interior Painting:

- 1. Do not begin application of paints and finishes until substrates have been properly prepared.
- 2. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- 3. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- 4. Test shop-applied primer for compatibility with subsequent cover materials.
- 5. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 - a. Gypsum Wallboard: 12 percent.
 - b. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
 - c. Concrete Floors and Traffic Surfaces: 8 percent.
- 6. Clean surfaces thoroughly and correct defects prior to application.
- 7. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- 8. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- 9. Seal surfaces that might cause bleed through or staining of topcoat.

10. Do Not Paint or Finish the Following Items:
 - a. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - b. Items indicated to receive other finishes.
 - c. Items indicated to remain unfinished.
 - d. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
 - e. Floors, unless specifically indicated.
 - f. Brick, architectural concrete, cast stone, integrally colored plaster and stucco.
 - g. Glass.
 - h. Concrete masonry units in utility, mechanical, and electrical spaces.
 - i. Acoustical materials, unless specifically indicated.
 - j. Concealed pipes, ducts, and conduits.
11. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.
12. Protect finishes until completion of project.
13. Touch-up damaged finishes after Substantial Completion.

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Division 10 – Specialties

GENERAL

A. Submittals:

1. Visual Display Units:

- a. For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for visual display surfaces.
- b. Shop Drawings:
 - i. For visual display surfaces. Include plans, elevations, sections, details, and attachments to other work.
 - ii. Show locations of panel joints.
 - iii. Show locations of special-purpose graphics for visual display surfaces.
 - iv. Include sections of typical trim members.
- c. Samples:
 - i. For each type of visual display surface indicated.
 - ii. Not less than 8-1/2 by 11 inches. Include one panel for each type, color, and texture required.
- d. Product Schedule: For visual display surfaces. Use same designations indicated on Drawings.

2. Signage:

- a. Shop Drawings:
 - i. Include fabrication and installation details and attachments to other work.
 - ii. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
 - iii. Show message list, typestyles, graphic elements, and layout for each sign at least half size.
 - iv. Show locations of electrical service connections.
 - v. Include diagrams for power, signal, and control wiring.
- b. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.
 - i. Include representative Samples of available typestyles and graphic symbols.

- c. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.
- 3. Toilet Compartments:
 - a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.
 - b. Shop Drawings:
 - i. Include plans, elevations, sections, and attachment details.
 - ii. Show locations of cutouts for compartment-mounted toilet accessories.
 - iii. Show locations of reinforcements for compartment-mounted grab bars and locations of blocking for surface-mounted toilet accessories.
 - iv. Show locations of centerlines of toilet fixtures.
 - v. Show locations of floor drains.
 - c. Samples:
 - i. For each type of toilet compartment material indicated.
 - ii. Include Samples of hardware and accessories involving material and color selection.
- 4. Wall and Corner Guards:
 - a. Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes for each impact-resistant door and wall protection unit.
 - b. Shop Drawings:
 - i. For each impact-resistant wall protection unit showing locations and extent. Include sections, details, and attachments to other work.
 - c. Samples:
 - i. For each type of exposed finish required, prepared on Samples of size indicated below.
 - ii. Corner Guards: 12 inches long. Include examples of joinery, corners, and field splices.
- 5. Fire Protection Specialties:
 - a. Provide extinguisher operational features, color and finish, and anchorage details.
 - b. Manufacturer's Installation Instructions:

- i. Indicate special criteria and wall opening coordination requirements.
 - c. Manufacturer's Certificate:
 - i. Certify that products meet or exceed specified requirements.
 - d. Maintenance Data:
 - i. Include test, refill or recharge schedules and re-certification requirements.
- 6. Flagpole:
 - a. Provide data on pole, accessories, and configurations.
 - b. Shop Drawings:
 - i. Indicate detailed dimensions, base details, anchor requirements, and imposed loads.
- B. Warranty:
 - 1. Visual Display Units:
 - a. Provide written warranty, signed by the manufacturer, to replace markerboards that fail in materials or workmanship.
 - i. Failures include, but are not limited to, the following:
 - (A) Surfaces lose original writing and erasing qualities.
 - (B) Surfaces exhibit crazing, cracking, or flaking.
 - ii. Warranty Period: 25 years.
 - 2. Signage:
 - a. Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - i. Failures include, but are not limited to, the following.
 - (A) Deterioration of finishes beyond normal weathering.
 - (B) Separation or delamination of sheet materials and components.
 - ii. Warranty Period: 5 years from date of Substantial Completion.
 - 3. Toilet Compartments
 - a. Correct defective Work within a two-year period after the Date of Substantial Completion.
 - 4. Wall and Corner Guards:
 - a. Manufacturer's standard form in which manufacturer agrees to repair or replace components of impact-resistant wall protection units that fail in materials or workmanship within specified warranty period.

- i. Failures include, but are not limited to, the following:
 - (A) Structural failures.
 - (B) Deterioration of materials beyond normal use.
 - ii. Warranty Period: Five years from date of Final Completion.
- 5. Fire Protection Specialties:
 - a. Correct defective Work within a two-year period after the Date of Substantial Completion.
- 6. Flagpole:
 - a. Correct defective Work within a two-year period after the Date of Substantial Completion.

PRODUCTS

- A. Visual Display Units:
 - 1. Source Limitations: Obtain visual display surfaces from single source from single manufacturer.
 - 2. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.
 - 3. Adhesives: Manufacturer's standard product that complies with 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."
 - 4. Markerboard Assemblies:
 - a. Porcelain-Enamel Markerboards: Balanced, high-pressure, factory-laminated markerboard assembly of three-ply construction consisting of backing sheet, core material, and 0.021-inch-thick, porcelain-enamel face sheet with high -gloss finish.
 - b. Low gloss white, suitable as a projection surface.
 - c. Magnetic, scratch & stain resistive.
 - d. Particleboard Core: 7/16-inch thick; with 0.005-inch-thick, aluminum foil backing.
 - e. Extruded aluminum, with concealed fasteners.
 - f. Laminating Adhesive: Manufacturer's standard, moisture-resistant thermoplastic type.

- g. Verify need for factory applied lines or graphing quadrants prior to ordering.
 - h. Accessories: marker tray, map rail, flag holder, and end stops.
 - i. Verify compliance with interactive projectors when used as a writing surface.
- 5. Glass Markerboard Assemblies:
 - a. Magnetic, one-sided glass markerboard composed of 1/4 " heat strengthened, tempered glass, with manufacturer's standard magnetic feature.
 - b. Color: White or Black.
 - c. Size: 4' x 8'.
- 6. Tackboard Assemblies:
 - a. Framed Natural-Cork Tackboard: 1/4-inch-thick, natural cork sheet factory laminated to 3/8-inch-thick fiberboard backing.
 - i. Natural homogeneous tackable surface material.
 - ii. 1/4 inch-thick, resilient tackable surface with jute backing. With aluminum frames and concealed fasteners, unless indicated otherwise on drawings.
 - b. 100% recycled rubber tackboards: no allergens. Anodized aluminum trim has a .88" profile with hairline mitered corners, stain resistant, non-fade, sound/shock absorbency.
- 7. Display Rail (Tack Strip):
 - a. Extruded-aluminum display rail with plastic impregnated cork.
- 8. Accessories:
 - a. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch-thick, extruded aluminum; standard size and shape.
 - b. Marker Tray:
 - i. Box Type: Extruded aluminum with slanted front, grooved tray, and cast-aluminum end closures.
 - ii. Solid Type: Extruded aluminum with ribbed section and smoothly curved exposed ends.
 - c. Map Rail: Extruded aluminum, manufacturer's standard profile, with cork insert and runners for accessories; 1-inch wide overall, full width of frame. One map hook for every 24 inches of map rail or fraction thereof complete with end stops.
 - d. Flag Holders: Cast aluminum bored to receive 1-inch diameter flag staff, bracketed to fit top rail of board.

- e. Special-Purpose Graphics: Fuse the following graphics into surface of porcelain-enamel visual display unit:
 - i. Verify need for board lining prior to ordering.
 - ii. Music – Staff Lines.
 - iii. Math – Quadrant Grid.

B. Signage:

- 1. General: Consult with District personnel on design aspects of all exterior sign graphics, fonts, placement, materials, mounting, lighting, location, etc.
- 2. Dimensional Characters:
 - a. Characters with uniform faces, sharp corners, and precisely formed lines and profiles, and as follows:
 - i. Character Material: Cast aluminum.
 - ii. Character Height: As indicated.
 - iii. Thickness: Manufacturer's standard for size of character.
 - iv. Finishes:
 - (A) Baked-Enamel or Powder-Coat Finish: Manufacturer's standard, in color as selected by architect from manufacturer's full range.
 - v. Mounting: Concealed studs.
 - vi. Typeface: Ariel.
 - b. Materials:
 - i. Aluminum Castings: ASTM B 26/B 26M, alloy and temper recommended by sign manufacturer for casting process used and for type of use and finish indicated.
 - ii. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.
 - c. Accessories:
 - i. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:
 - (A) Use concealed fasteners and anchors unless indicated to be exposed.
 - (B) For exterior exposure, furnish nonferrous-metal devices unless otherwise indicated.

(C) Exposed Metal-Fastener Components, General:

- (1) Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
- (2) Fastener Heads: For nonstructural connections, use flathead or oval countersunk screws and bolts with tamper-resistant slots unless otherwise indicated.

(D) Sign Mounting Fasteners:

- (1) Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.
- ii. Adhesives: As recommended by sign manufacturer and that comply with 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."
- iii. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045-inch thick, with adhesive on both sides.
- iv. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

3. Panel Signage:

- a. Comply with applicable provisions in the U.S. architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for signs.
- b. Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles, and as follows:
 - i. Wood and Laminated Sheet Sign: Combination of wood face with engraved graphics and composite solid phenolic panel core with polymeric face layer and raised graphics; including up-datable inserts behind acrylic panel.
 - (A) Thickness: 8.0 mm, 0.31 inch.
 - (B) Size: TBD.
 - (C) Etched and Filled Graphics: Sign face etched or routed to receive enamel-paint infill.
 - ii. Sign-Panel Perimeter:
 - (A) Edge Condition: Square cut, finished smooth.

- (B) Corner Condition in Elevation: Square.
- iii. Frame: Horizontal Retainers:
 - (A) Material High Quality Aluminum.
 - (B) Material Thickness. 6063 thickness of 3.0 mm (0.12 inch).
 - (C) Frame Depth: 3.0 mm (0.12 inch).
 - (D) Profile: Square.
 - (E) Corner Condition in Elevation: Square.
 - (F) Finish and Color: match door hardware.
- iv. Wood:
 - (A) Type: Veneer over MDF.
 - (B) Species: Clear White Birch.
 - (C) Cut: Plain Sliced.
 - (D) Thickness: 5.0 mm (0.2 inch).
- v. Phenolic Core:
 - (A) Material: Solid panel manufactured using a combination of high pressure and temperature to create a flat panel of thermosetting resins, homogeneously reinforced with wood-based fibers and integrated decorative surface or printed color.
 - (B) Color on exposed Faces: As selected from Manufacturer's full range.
 - (C) Finish: match door hardware.
 - (D) Panel Thickness: 5.0 mm (0.2 inch).
- vi. Glazing:
 - (A) Material: Clear Acrylic.
 - (B) Thickness: 5.0 mm (0.2 inch).
- vii. Mounting: Manufacturer's standard method for substrates indicated Surface mounted to wall with adhesive.
- viii. Surface Finish and Applied Graphics:
 - (A) Painted Finish and Graphics: Manufacturer's standard, factory-applied acrylic polyurethane in color as selected by architect from Manufacturer's full range.
 - (B) Etched and Filled Graphics: Sign face etched or routed to receive enamel-paint infill.

- ix. Overcoat: Manufacturer's standard baked-on clear coating.
- x. Stain: Manufacturer's standard clear coat matte finish.
- xi. Text and Typeface: Accessible raised characters and Braille typeface as selected by architect from manufacturer's full range.
- xii. Flatness Tolerance: Sign panel shall remain flat or uniformly curved under installed conditions as indicated and within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner.

C. Toilet Compartments:

1. Factory fabricated doors, pilasters, and divider panels made of solid molded high-density polyethylene (HDPE), tested in accordance with NFPA 286, floor-mounted, headrail-braced, ceiling-mounted.
 - a. Comply with ASTM E84, Class B, for finish surfaces of partition systems.
 - b. Color: TBD.
 - c. Texture: OP - Orange Peel.
 - d. Doors:
 - i. Thickness: 1 inch.
 - ii. Width: 24 inch.
 - iii. Width for Handicapped Use: 36 inch. Verify swing of door to comply with accessibility code.
 - iv. Height: 55 inch.
 - e. Panels:
 - i. Thickness: 1 inch.
 - ii. Height: 55 inch.
 - iii. Depth: As indicated on Contract Documents and Specifications.
 - f. Pilasters:
 - i. Thickness: 1 inch.
 - ii. Width: As required to fit space; minimum 3 inch.
 - g. Screens:
 - i. Without doors, to match compartments; mounted to wall with continuous panel brackets.
 - h. Urinal Screens –
 - i. Minimum Size: 24 inches wide x 48 inches high, bottom edge positioned 12 inches above floor surface. Wall mounted with

two panel brackets, and floor-to-ceiling vertical upright consisting of pilaster anchored to floor and ceiling.

2. Accessories:

a. Pilaster Shoes:

- i. Formed ASTM A666, Type 304 stainless steel with No. 4 finish, 3 in high, concealing floor and ceiling fastenings.
- ii. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.
- iii. Provide ceiling attachment using two adjustable hanging studs, attached to above-ceiling framing.

b. Head Rails:

- i. Hollow anodized aluminum, 1 by 1 ½-inch size, with anti-grip profile and cast socket wall brackets.

c. Wall and Pilaster Brackets:

- i. Polished stainless steel.

d. Attachments, Screws, and Bolts:

- i. Stainless steel, tamper proof type.

e. For attaching panels and pilasters to brackets:

- i. Through-bolts and nuts; tamper proof.

f. Hardware:

- i. Satin stainless steel: 1092 heavy duty hardware.
 - (A) Pivot hinges, gravity type, adjustable for door close positioning; two per door.
 - (B) Heavy duty hinges, gravity type, adjustable for door close positioning; two per door. Provide hinges that are continuous, integral, or wrap around - through bolted onto partition.
 - (C) Thumb-turn door latch with exterior emergency access feature.
 - (D) Door strike and keeper with rubber bumper; mounted on pilaster in alignment with door latch.
 - (E) Coat hook with rubber bumper; one per compartment, mounted on door.
 - (F) Provide door pull for outswinging doors.

D. Wall and Corner Guards:

1. Corner Guards—New construction:

- a. Surface-Mounted, Metal Corner Guards: Fabricated from one-piece, formed or extruded metal with formed edges; with 90- or 135-degree turn to match wall condition.
 - b. Material: Stainless steel, Type 304.
 - c. Thickness: Minimum: 18 gauge.
 - d. Finish: Directional satin, No. 4.
 - e. Wing Size: Nominal 2-1/2 by 2-1/2 inches with beveled edges.
 - f. Height: 48 inches, unless indicated otherwise.
 - g. Corner Radius: 1/8 inch.
 - h. Mounting: Adhesive and/ or Anchors.
 - 2. Corner Guards—existing construction: Match existing.
- E. Fire Protection Specialties:
- 1. Fire Extinguishers:
 - a. Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
 - i. Provide extinguishers labeled by UL for the purpose specified and indicated.
 - b. Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gage.
 - i. Class: 4A:60B:C.
 - ii. Size: 10 pound.
 - iii. Finish: Baked polyester powder coat, red color.
 - iv. Temperature Range: -65 degrees F to 120 degrees F.
 - c. Wet Chemical Type Fire Extinguishers: Stainless steel tank, with pressure gage.
 - i. Class: K, containing potassium acetate, low pH agent leaving no chemical residue.
 - ii. Size: 2.5 gallons.
 - iii. Finish: Polished stainless steel.
 - iv. Temperature Range: -20 degrees F to 120 degrees F.
 - d. Cabinets:
 - i. Material:
 - (A) Formed aluminum.
 - ii. Cabinet Configuration:

- (A) Semi-recessed type, unless otherwise indicated or specified.
 - (B) Sized to accommodate scheduled items and accessories.
 - (C) Trimless type.
 - (D) Form cabinet enclosure with right angle inside corners and seams. Form perimeter trim and door stiles.
 - iii. Door:
 - (A) 0.036-inch thick, reinforced for flatness and rigidity, latch. Hinge doors for 180 degree opening with two butt hinge.
 - (B) Provide nylon catch.
 - iv. Door Glazing:
 - (A) Plastic, clear, 1/8-inch thick acrylic. Set in resilient channel gasket glazing.
 - v. Cabinet Mounting Hardware:
 - (A) Appropriate to cabinet. Pre-drill for anchors.
 - (B) Weld, fill, and grind components smooth.
 - vi. Finish of Cabinet Exterior Trim and Door:
 - (A) Anodized to color as selected.
 - vii. Locks:
 - (A) Manufacturer's proprietary keyed lock that secures door, permitting opening of door in emergency without breaking glass.
 - (B) Provide two (2) keys per cabinet and key all cabinets alike. Larsen's key CH751 or J.L. key BH005.
- e. Defibrillators:
 - i. Automated external defibrillator (AED) unit and cabinet; complete assembly for wall mounting.
 - (A) Acceptable Manufacturer:
 - (1) Heart Smart Technology:
 - (a) Defibrillator: Philips Heartstart FRX AED; Model 861304.
 - (b) Cabinet: Philips Basic Alarmed AED Cabinet; Model 9898031365321.
- f. Accessories:

- i. Fire Blanket:
 - (A) Fire retardant treated wool; red, 62 by 84-inch size.
- ii. Extinguisher Brackets:
 - (A) Formed steel, chrome plated.
- iii. Graphic Identification:
 - (A) "FIRE EXTINGUISHER".

F. Metal Lockers:

1. Applications:

a. Athletic Locker Units:

- i. Seven tier metal lockers, fully welded; each compartment configured as follows:
 - (A) Width: 15 inches.
 - (B) Depth: 15 inches.
 - (C) Height: 72 inches, 10 (+) inches each compartment.
 - (D) Base: Concrete base.
 - (E) Base height: 4 inches.
 - (F) Locking: Hasp for padlock/key operation.
 - (G) Provide sloped top.
 - (H) Type: Quiet type.

b. Athletic Locker Units:

- i. Two tier metal lockers, fully welded; each compartment configured as follows:
- ii. Width: 15 inches.
- iii. Depth: 15 inches.
- iv. Height: 72 inches, 36 inches each compartment.
- v. Base: Concrete base.
- vi. Base height: 4 inches.
- vii. Locking: Hasp for padlock/key operation.
- viii. Provide sloped top.
- ix. Type: Quiet type.

c. Locker Benches:

- i. Stationary type: locker manufacturer's standard bench top of laminated maple species wood, stained, sealed and varnished; pedestals of powder coated steel, 18 inches high.
 - d. Accessories for Each Locker:
 - i. Three single prong wall hooks, One double prong ceiling/shelf hook. Identification plate and tamper resistant rubber silencers.
- 2. Metal Lockers:
 - a. Factory assembled, made of formed sheet steel, ASTM A653/A653M SS Grade 33/230, with G60/Z180 coating, stretcher leveled; metal edges finished smooth without burrs; baked enamel finished inside and out.
 - i. Athletic Lockers: All welded.
 - (A) Body Frame: 14 gage, 0.075 inch.
 - (B) Body: 18 gage.
 - (C) Floor: 18 gage.
 - (D) Shelf: 24 gage.
 - (E) Door: 14 gage, 0.075 inch.
 - (F) Door Frame: 16 gage, 0.060 inch.
 - (G) Hinges: 14 gage, 0.075 inch. 2 inches high, five knuckle, full loop, tight pin style.
 - (H) Sloping Top: 18 gage.
 - (I) Trim: 20 gage, 0.036 inch. 14 gage 10" or wider.
 - ii. Where ends or sides are exposed, provide flush panel closures.
 - iii. Provide filler strips where indicated or required, securely attached to lockers.
 - iv. Color: To be selected by consultant; allow for contrasting colors for locker bodies and doors.
 - b. Frames:
 - i. Formed channel shape, welded and ground flush, welded to body, resilient gaskets and latching for quiet operation.
 - (A) Door Frame: 16 gage, 0.0598-inch, minimum.
 - c. Doors:
 - i. Hollow double pan, sandwich construction, 1 3/16-inch thick; welded construction, channel reinforced top and bottom with intermediate stiffener ribs, grind and finish edges smooth.
 - (A) Door Outer Face: 18 gage, 0.0478-inch, minimum.

(B) Door Inner Face: 20 gage, 0.0359-inch, minimum.

(C) Form recess for operating handle and locking device.

- d. Door Ventilation:
 - i. Secur-N-Vent doors with three-dimensional vertical vents formed on fronts and backs of door.
- e. Hinges:
 - i. Two for doors under 42 inches high; three for doors over 42 inches high; weld securely to locker body and door.
 - ii. Hinge Thickness: 14 gage, 0.0747 inch.
- f. Coat Hooks:
 - i. Stainless steel or zinc-plated steel.
- g. Number Plates:
 - i. Match existing.
- h. Finishing:
 - i. Clean, degrease, and neutralize metal; prime and finish with one coat of baked enamel.
 - ii. Paint locker bodies and doors in contrasting colors.
 - iii. Paint locker units colors as selected from manufacturer's full range of available standards. Athletic lockers shall be painted with "Powdercoat Plus" or "X-off Anti-Graffiti".

G. Flagpoles:

1. General: Flagpole and all accessories shall be made in the USA.
2. Assemblies:
 - a. Flagpole with Flag Flying: Resistant without permanent deformation to minimum 130 miles/hr. wind velocity per PPRBD; non-resonant, safety design factor of 2.5.
 - b. Flagpole Without Flag: Resistant without permanent deformation to minimum 150 miles/hr. wind velocity; non-resonant, safety design factor of 2.5.
3. Flagpoles:
 - a. Flagpoles: Aluminum.
 - i. ASTM B221 (ASTM B 221M), 6063 alloy, T6 temper.
 - b. Pole: Straight shaft.
 - c. Mounting: Ground mounted type.
 - d. Outside Butt Diameter: 6 inches.

- e. Outside Tip Diameter: 3.5 inches.
 - f. Nominal Wall Thickness: 0.1875 inches.
 - g. Nominal Height: 30 ft; measured from nominal ground elevation.
 - h. Halyard: Exterior type.
4. Accessories:
- a. Finial Ball: Stainless steel, 6-inch diameter.
 - b. Truck Assembly: Cast aluminum; revolving, stainless steel ball bearings, non-fouling.
 - c. Flag #1: United States of America design, 60 x 84-inch size, embroidered nylon fabric, brass grommets, hemmed edges.
 - d. Flag #2: State of Colorado design, [60 x 84] inch size, embroidered nylon fabric, brass grommets, hemmed edges.
 - e. Cleats: 9-inch size, aluminum with galvanized steel fastenings, two per halyard.
 - f. Cleat Box: Aluminum, with built-in hinge and hasp assembly, attached to pole with tamper proof screws inside box.
 - g. Halyard: 5/16-inch diameter stainless steel aircraft cable. Provide 2 pairs of snaps.
5. Mounting Components:
- a. Foundation Tube Sleeve: AASHTO M 36M, corrugated 16 gage, 0.0598-inch steel, galvanized, depth of 48 inches, minimum.
 - b. Pole Base Attachment: Flush; steel base with base cover.
 - c. Grounding / Lightning Protection per NFPA:
 - i. Strike termination device.
 - ii. Down conductor.
 - iii. Ground terminal.
 - iv. Bonding to metal objects within 12-foot radius.
6. Maintenance Materials:
- a. External halyard.
 - i. Two (2) cranks.
 - ii. One (1) truck.
 - iii. One (1) winch.
 - iv. One (1) weight assembly.

H. Mailbox Key Keepers (Traka Key system):

1. Requires an adjacent outlet, wire mold, and coordination with District personnel.
2. Model: Traka 21

EXECUTION

A. Visual Display Units:

1. Comply with manufacturer's written instructions for surface preparation.
2. Examine substrates and conditions, with installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the work.
3. Examine roughing-in for electrical power systems to verify actual locations of connections before installation of motor-operated, sliding visual display units.
4. Examine walls and partitions for proper preparation and backing for visual display surfaces.
5. Proceed with installation only after unsatisfactory conditions have been corrected.
6. Install with bottom of perimeter frame at 36 inches above finished floor per ADA standards.
7. Secure units level and plumb.

B. Signage:

1. Interior signage shall be installed to comply with all applicable Accessibility Standards.
2. Comply with manufacturer's written instructions for surface preparation.
3. Install signs using mounting methods indicated and according to manufacturer's written instructions.
 - a. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
 - b. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
 - c. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

C. Toilet Compartments:

1. Verify that field measurements are as indicated on the Contract Documents and Specifications.
2. Verify correct spacing of and between plumbing fixtures.
3. Verify correct location of built-in framing, anchorage, and bracing.

4. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.
5. Maintain 3/8 to 1/2-inch space between wall and panels and between wall and end pilasters.
6. Attach panel brackets securely to walls using anchor devices.
7. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.
8. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

D. Wall and Corner Guards:

1. Examine substrates and wall areas, with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
2. Examine walls to which impact-resistant wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
3. Proceed with installation only after unsatisfactory conditions have been corrected.
4. Install impact-resistant wall protection units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, scratches, or other defects that might be visible in the finished Work.
 - a. Provide mounting hardware, anchors, and other accessories required for a complete installation.
 - b. Provide anchoring devices to withstand imposed loads.

E. Fire Protection Specialties:

1. Verify rough openings for cabinet are correctly sized and located.
2. Install in accordance with manufacturer's instructions.
3. AED Cabinets: Install cabinets plumb and level on wall surfaces, maximum 48 inches from finished floor to top of cabinet.
4. Secure rigidly in place.
5. Place extinguishers in cabinets.
6. Fill and charge extinguishers immediately prior to Substantial Completion.

F. Metal Lockers:

1. Examine walls, floors, and support bases, with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

2. Prepare written report, endorsed by installer, listing conditions detrimental to performance of the Work.
3. Proceed with installation only after unsatisfactory conditions have been corrected.
4. Install lockers level, plumb, and true; shim as required, using concealed shims.
5. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.
6. Touch up marred finishes or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

G. Flagpole:

1. Verify that concrete foundation is ready to receive work and dimensions are as indicated on shop drawings.
2. Coat metal sleeve surfaces below grade and surfaces in contact with dissimilar materials with asphaltic paint.
3. Install flagpole, base assembly, and fittings in accordance with manufacturer's instructions.
4. Fill foundation tube sleeve with concrete specified in the Contract Documents and Specifications.
5. Install foundation plate and centering wedges for flagpoles base set in concrete base and fasten.
6. Maximum Variation from Plumb: 1 inch.

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Division 11 – Equipment

GENERAL

A. Loading Dock Bumpers:

1. Submittals:

- a. Indicate unit dimensions, method of anchorage, and details of construction.

B. Residential Appliances:

1. Submittals:

- a. For each type of product indicated. Include rated capacities, operating characteristics, dimensions, furnished accessories, and finishes for each appliance.
- b. Product Schedule:
 - i. For appliances. Use same designations indicated on Contract Documents and Specifications.
- c. Operation and Maintenance Data:
 - i. For each residential appliance to include in operation and maintenance manuals.

2. Regulatory Requirements:

- a. Comply with the following:
 - i. NFPA: Provide electrical appliances listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

3. Accessibility:

- a. Where residential appliances are indicated to comply with accessibility requirements, comply with the U.S. architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

4. Warranty:

- a. Provide five (5) year manufacturer warranty on refrigeration system of refrigerators.
- b. Provide ten (10) year manufacturer warranty on tub and door liner of dishwashers.

C. Food Service Equipment:

1. Food service equipment shall be selected and specified by a food service consultant.
2. Food service equipment shall include but not limited to:

- a. Sinks and basins.
 - b. Grease interceptors.
 - c. Ovens.
 - d. Ranges.
 - e. Refrigeration Equipment.
 - f. Shelving & Racking.
 - g. Utensils.
 - h. Serving Line Equipment.
 - i. POS Equipment.
 - j. Hood Systems.
 - k. HVAC Systems.
 3. Coordinate needs with District and End-User.
- D. Projection Screens:
 1. Submittals:
 - a. Manufacturer's data sheets on each product to be used, including:
 - i. Preparation instructions and recommendations.
 - ii. Storage and handling requirements and recommendations.
 - iii. Installation methods.
 - iv. Wiring diagram for electrically operated units.
 - b. Shop Drawings:
 - i. Shop drawings showing layout and types of projection screens.
Show the following:
 - (A) Location of screen centerline.
 - (B) Location of wiring connections.
 - (C) Connections to suspension systems.
 - (D) Anchorage details.
 - (E) Accessories.
 - c. Samples:
 - i. For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- E. Laboratory Equipment:
 1. Submittals:

- a. Provide equipment dimensions and construction, equipment capacities, physical dimensions, utility and service requirements and locations, point loads.
 - b. Shop Drawings:
 - i. Prepared specifically for this project; show dimensions and interface with other products.
 - c. Samples:
 - i. Enclosure cabinet wall material, baffle, air foil, front panel color chips, and work surface material.
 - d. Maintenance Data:
 - i. Identify system maintenance requirements, servicing cycles, lubrication types required and local spare part sources.
 - e. Warranty Documentation:
 - i. Submit manufacturer warranty and ensure that forms have been completed in District 20's name and registered with manufacturer.
 - f. Conform to UL requirements for fabrication and installation of acid and flammable cabinet equipment.
2. Warranty:
- a. Correct defective Work within a one-year period after Date of Substantial Completion.
- F. Gymnasium Equipment:
- 1. Submittals:
 - a. Provide manufacturer's data showing configuration, sizes, materials, finishes, hardware, and accessories; include:
 - i. Electrical characteristics and connection locations.
 - ii. Fire rating certifications.
 - iii. Structural steel welder certifications.
 - iv. Manufacturer's installation instructions.
 - b. Shop Drawings:
 - i. For custom fabricated equipment indicate, in large scale detail, construction methods; method of attachment or installation; type and gage of metal, hardware, and fittings; plan front elevation; elevations and dimensions; minimum one cross section; utility requirements as to types, sizes, and locations.
 - c. Samples:

- i. Submit samples of wall pad coverings in manufacturer's available range of colors.
 - d. Operating and maintenance data, for each operating equipment item.
- 2. Warranties:
 - a. Submit manufacturer warranty and ensure that forms have been completed in District 20's name and registered with manufacturer.
 - b. Manufacturer agrees to repair or replace components of gymnasium equipment that fail in materials or workmanship within specified warranty period.
 - i. Failures include, but are not limited to, the following:
 - (A) Basketball backboard failures including glass breakage.
 - (B) Faulty operation of basketball backstops.
 - ii. Warranty Period: 10 years from date of Substantial Completion.
- 3. Interior Scoreboards:
 - a. Submittals:
 - i. Provide data for each equipment item, describing installation requirements, construction features, accessory components, and other pertinent data.
 - ii. Shop Drawings:
 - (A) Indicate each equipment item showing sizes, dimensions, layouts, setting layouts, and required anchorage based on actual field measurements.
 - iii. Operation and Maintenance Data:
 - (A) Submit data for each equipment item, including spare parts lists and manufacturer's printed warranties.
 - b. Warranty:
 - i. Submit manufacturer warranty and ensure that forms have been completed in District 20's name and registered with manufacturer.
 - ii. Correct defective Work within a two-year period after Date of Substantial Completion.
- 4. Playground Equipment:
 - a. Submittals:
 - i. Submit manufacturer's technical data and installation instructions for each item of equipment required and for the associated drainage system.

- ii. Provide statement of accessibility from manufacturer, including total number of play components as well as total number of accessible components.
- iii. Provide both plan view and 3-dimensional views of equipment.
- b. Safety:
 - i. American Society for Testing and Materials (ASTM) designation F1487 98(or current issue) “Standard Consumer Safety Performance Specification for Playground Equipment for Public Use.”
 - (A) U.S. Consumer Product Safety Commission (CPSC) Handbook for Public Playground Safety (Publication No. 325) (based on ASTM F 1487).
 - (B) CPSC Playground Surfacing Materials (Publication No. 325).
 - (C) CPSC Guidelines for Movable Soccer Goal Safety (Publication No.326).
- c. Quality Assurance:
 - i. Poured in Place Fall Surfacing Certifications:
 - (A) Poured-in-Place Fall Surfacing shall meet impact attenuation requirements of ASTM F 1292-99 – Standard Specification for Impact Attenuation of Surface Systems Under and Around Playground Equipment.
 - (1) For Poured-in-place Fall Surfacing:
 - (a) G-max values less than 120G for 12” system at a 12’ drop height.
 - (b) HIC value less than 1,000 for both new and 12-year old material.
 - (B) Meet requirements of ASTM F 1951, Standard Specification for Determination of Accessibility of Surface Systems Under and Around Playground Equipment.
 - (C) Meet accessibility requirements of Access Board, Final Report.
 - (D) EWF surfacing shall meet ADA compaction requirements upon completion of work. The contractor shall provide testing to comply with this requirement.
 - ii. Place no fall surfacing until all structures have been placed.
- d. Warranty:

- i. Submit manufacturer warranty and ensure that forms have been completed in District 20's name and registered with manufacturer.
 - ii. Correct defective Work within a two-year period after Date of Substantial Completion.
- 5. Athletic Equipment:
 - a. Submittals:
 - i. Submit manufacturer's technical data and installation instructions for each item of equipment required.
 - ii. Operations and Maintenance:
 - (A) Provide tools, touch-up paint, maintenance recommendations, recommendations for graffiti removal and spare parts including nuts and bolts.
 - b. Warranty:
 - i. Submit manufacturer warranty and ensure that forms have been completed in District 20's name and registered with manufacturer.
 - ii. Correct defective Work within a two-year period after Date of Substantial Completion.
- 6. Custodial Equipment
 - a. Submittals:
 - i. Refer to District's list of approved custodial equipment items in the latest edition of the Academy District 20 Facilities Management Operations & Maintenance Guidance Manual.
 - b. Coordinate installation of District 20-provided items with District representative.
 - c. Operation and Maintenance Data:
 - i. Provide all data for each equipment item, including spare parts lists and manufacturer's printed warranties, in close out documents.

PRODUCTS

A. Loading Dock Bumpers:

1. Bumpers:

- a. Rite-Hite Model 'R'; molded rubber, ozone resistant, nylon reinforced, minimum Shore A Durometer of 70, tensile strength of 950 to 1050 psi:
 - i. Thickness from Wall: 4 inches.
 - ii. Vertical Height: 12 inches.

- iii. Width: 13 inches.
- iv. Profile: Rectangular.
- v. Attachment Hardware:
 - (A) 3/4-inch diameter galvanized bolts and expansion shields.
- vi. Touch-up Primer:
 - (A) Zinc rich type.

B. Residential Appliances:

- 1. Microwave Oven:
 - a. Type: Countertop.
 - b. Electrical Power: 120 V, 60 Hz, 1 phase, 15A (Verify with District 20).
 - c. Energy Performance, ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product labeling program.
- 2. Refrigerator/Freezer:
 - a. Complying with AHAM HRF-1
 - b. Type: Freestanding.
 - c. Dispenser for ice and cold water.
 - d. Electrical Power: 120 V, 60 Hz, 1 phase, 15A (Verify with District 20).
 - e. Energy Performance, ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product labeling program
- 3. Dishwasher:
 - a. Complying with AHAM DW-1.
 - b. Type: Built-in undercounter.
 - c. Electrical Power: 120 V, 60 Hz, 1 phase, 15A (Verify with District 20).
 - d. Energy Performance, ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product labeling program.
- 4. Clothes Washer/Dryer Combination:
 - a. Comply with AHAM HLW-1.
 - b. Ensure proper ventilation as required by code.
 - c. Type: Freestanding, stackable, front-loading unit.
 - d. Electrical Power: 240 V, 60 Hz, 1 phase, 30A (Verify with District 20).
 - e. Energy Performance, ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product labeling program.

C. Projection Screens:

1. Large electrically operated, tab tensioned, extruded aluminum case. Projection screen with motor in roller.
2. Case fully enclosed except for slot allowing viewing surface passage.
3. Roller: 6 inches (152 mm) diameter steel tube.
4. Viewing surface securely attached to roller at top and at bottom to weighted dowel.
5. Provided with universal mounting brackets for ceiling or above ceiling mounting.
6. Motor UL certified, rated 110-120V AC, 60 Hz, three wire, instantly reversible, lifetime lubricated with pre-set accessible limit switches.
7. Low Voltage Control (LVC) System:
 - a. Low voltage control unit with three button 24V switches and cover plate to stop or reverse screen at any point, built-in RF receiver, built-in Video Interface Control trigger for 3V-28V, RS232, and dry contact relays.
8. Viewing Area:
 - a. HDTV Format (16:9). Black masking borders standard.
9. Provide an extra screen drop with an overall screen drop per drawings with a black masking top border.
10. Tab-Tensioning System:
 - a. Viewing surface with integrated tabs and cable on each side of fabric to provide tension and ensure flat viewing surface. Viewing surface and tabs CNC cut as a single piece. Tabs RF welded to the back of viewing surface to prevent tab separation. Tab adhesives are not acceptable. Warranted for 5 years against tab separation. Viewing surface inserted into aluminum bottom dowel.

D. Laboratory Equipment:

1. Chemical and Flammable Storage Cabinets:
 - a. All steel construction with integral reservoir base.
 - b. Chemical resistant, baked-on enamel coating.
 - c. Interior polypropylene lining.
 - d. Locking doors.
 - e. Chemical spill reservoir.
 - f. Acid resistant shelving.
 - g. Self-closing doors.
 - h. OSHA and NFPA-30 approved.

- i. Separate poly cube to be provided for nitric acid storage.
 - j. Vents: Comply with SEFA 1.2:
 - i. Locate acid-storage cabinet vents in accordance with manufacturer's instructions.
 - ii. Vent base cabinets through work surface with manufacturer's vent kit.
 - iii. Vent each acid-storage cabinet separately.
 - iv. Seal all penetrations with chemical-resistant sealant.
 - k. Installation Accessories:
 - i. Provide all rough-in frames, anchors, supports, accessories and closure trim required for complete installation.
2. Fume Hoods:
- a. Floor mounted, remote blower exhaust type, complete with enclosures, operable glazed sash, service fixtures, and utility connections; made in sizes to suit standard laboratory casework modules.
 - i. Provide air flow design that minimizes face velocity fluctuations when the sash is operated.
 - ii. Complying with requirements of:
 - (A) SEFA 1.2.
 - (B) NFPA 45 requirements relating to hoods.
 - (C) ANSI/AIHA Z9.5, Laboratory Ventilation.
 - b. Hood Enclosures:
 - i. Formed sheet steel exterior with molded composite board interior liner and baffles.
 - ii. Exterior Panels: Minimum 20-gauge, 0.036 inch cold rolled steel sheet.
 - iii. Corner Posts: 16-gauge, 0.06-inch steel sheet, angled aerodynamic design; pre-punched to accommodate 4 service fixtures and 2 electrical receptacles on each side; unused openings plugged.
 - iv. Rear Panel: 16-gauge, 0.06-inch steel sheet.
 - v. Interior Liner and Baffles: White 3/16-inch thick chemical-resistant composite material, with flame spread index of less than 25 when tested in accordance with ASTM E84; Glastic Corporation.

- vi. Baffles removable for cleaning; providing uniform draw throughout the hood cavity.
 - vii. Sash Frames: Epoxy-coated aluminum.
 - viii. Interchangeable front and side panels easily removable for access and maintenance; all services accessible from front.
 - ix. Exterior Finish: Baked-on powder-coated epoxy, electrostatically applied after preparation, except rear panel may be galvanized.
 - x. Exterior Color: To be selected by architect from manufacturer's full range of colors.
- c. Benchtap ADA-Compliant Fume Hoods:
- i. Counterweighted vertically rising sash; single sash up to 60 inches wide, post-less multiple sash for 60 inches and wider.
 - (A) Vapor-proof.
 - (B) Sash Glazing: 3/16-inch tempered safety glass.
 - (C) Sash Height: 37 inches, total; 31 inches operable.
 - (D) Inflow Velocity: With bottom edge of sash 6 inches above airfoil sill, inflow velocity at least two times but not more than three times fully open velocity.
 - (E) Exhaust Connections: 12.81 inches diameter powder-coating Type 316 stainless steel entry cone.
 - (1) Less Than 96 Inches Wide: One exhaust connection.
 - (F) Height: 59 inches.
 - (G) Width: 48 inches.
 - (H) Exhaust Volume: 730 cfm, minimum.
 - (I) Static Pressure Loss: 0.16 inches.
- d. Service Fixtures and Options Required:
- i. Factory-installed and plumbed/wired; located and arranged as indicated on Contract Documents and Specifications.
 - (A) Hot Water.
 - (B) Cold Water: Gooseneck spout, with vacuum breaker, and 3/8-inch diameter tubing.
 - (C) Natural Gas: Mounted at upper right.
 - (D) Two duplex electrical receptacles.
 - (E) One fire extinguisher.

- e. Components:
 - i. Vertical Rising Sash Counterweight System:
 - (A) Vinyl coated stainless steel cables running on nylon ball bearing pulleys; providing smooth operation without racking and holding sash in position at any open position; one counterweight per sash.
 - ii. Lighting Fixtures:
 - (A) LED lamps of size and wattage to suit width of hoods (except explosion-proof hoods).
 - (1) 48 Inches Wide: Two 36-inch long, 25 watt.
 - (B) Vapor-Proof Hoods: Lighting fixtures mounted behind tempered glass safety shield on top of hood liner, serviceable from outside hood; light switch, blower switch, and internal wiring to junction box.
 - iii. Electrical Receptacles:
 - (A) 115 volt, 3-wire.
 - (B) Vapor-Proof Hoods: Polarized and ground-fault protected.
 - iv. Service Fixture Valves:
 - (A) Remote controlled forged brass valves and seats.
 - (B) TFE-coated silicone bronze stem and TFE packing; located inside hood cavity.
 - v. Service Lines:
 - (A) 1/4-inch diameter copper tubing.
 - (B) Gas Valves: Brass tubing.
 - vi. Work Surfaces:
 - (A) Solid epoxy, 1-1/4 inches thick, dished to retain spills; sized to fit interior of hood; 1 inch aerodynamic radiused front edge; provide the following accessories.
 - (B) Cup Sink: 6 by 3 inches oval, epoxy; 1 1/2-inch drain connection.
 - vii. Fire Extinguisher:
 - (A) ABC-rated dry powder, activated by fusible link at 165 degrees F, automatically discharging within 5 seconds; visual pressure gauge; rechargeable.
 - viii. Base Cabinet:

- (A) Metal base cabinet to match the width and depth of the fume hood. Height of cabinet to be 30 inches.

E. Gymnasium Equipment:

1. Divider Curtains:

- a. Curtain Material: Class A-rated, self-extinguishing vinyl coated polyester meeting NFPA 101.
- b. Upper Section: Minimum 7 oz/sq. yd vinyl mesh fabric.
- c. Color: As selected from manufacturer's standard line.
- d. Lower Section (8 feet): Minimum 18 oz/sq. yd solid vinyl coated polyester.
- e. Color: As selected from manufacturer's standard line.
- f. Operation: Center roll folding.
- g. Controls: Key Switch controlling winch motor(s).
- h. Size: As indicated on Contract Documents and Specifications.

2. Basketball:

- a. Ceiling-Suspended Backstop Assemblies:
 - i. Capable of mounting both rectangular and fan-shaped backboards.
 - ii. Framing: Center strut; forward folding framing.
 - iii. Folding Control System: Electric hoist that folds backstop with 115-volt actuator, integral limit switches that provide automatic shut-off in both positions, and safety catch with automatic reset.
 - iv. Manufacturer's standard key switch.
 - v. Height Control System: Manual winch.
 - vi. Framing Color: As selected from manufacturer's standard selection.
- b. Backboards:
 - i. Main Court: Rectangular glass.
 - ii. Cross Court: Rectangular fiberglass.
 - iii. Frame: Brushed aluminum edge, steel mounting.
 - iv. Markings: Painted.
 - v. Provide safety padding for bottom edge of backboard.
 - vi. ½ Thick tempered glass.
 - vii. Color: TBD.

- c. Goals:
 - i. Steel rim, mounted to backboard, with attached nylon anti-whip net, complete with mounting hardware.
 - ii. Main Court: Torq-Flex, adjustable.
 - iii. Cross Court: Standard front mount.
 - iv. Net Attachment Device: Tube-tie.
 - v. Breakaway mechanism, adjustable.
 - vi. Finish: Powder coat orange.
- 3. Floor Mounted Equipment:
 - a. Volleyball Nets and Posts:
 - i. One court system of adjustable posts, net, and tensioning winch meeting all requirements for FIVB, USA Volleyball, NCAA and NFHS competition requirements.
 - (A) Posts: 3 ½-inch O.D. schedule 80 aluminum tube with 1-inch height adjustments between 42 and 96 inches.
 - (B) Net: 4-inch square #36 nylon cord with vinyl coated polyester hem, double stitched around the perimeter.
 - (C) Top Hem Reinforcing: 2000-pound minimum break strength galvanized aircraft cable in nylon coating.
 - (D) Bottom Hem Reinforcing: 1/4-inch diameter braided nylon rope with spring loaded, pressure type rope tensioner.
 - (E) Size: Regulation size.
 - (F) Tensioning Winch: Manual crank heavy duty, self-locking worm gear mechanism.
 - (G) Antenna and boundary marker.
 - (H) Protective Pads: Polyethylene foam covered with polyester reinforced vinyl fabric.
 - ii. Floor Sleeves for Posts:
 - (A) Metal sleeve, with latch cover, cast into concrete subfloor to hold poles for nets and goals, installed flush with finish floor surface.
 - (B) Latch Cover: Brass, round; tamper resistant lock with key.
 - (C) Sleeve: Aluminum.
 - (D) Round Pole Diameter: 3-1/2 inches.

(E) Depth of Sleeve: 9 inches from floor surface to bottom, including latch cover.

4. Wall Padding:

- a. Foam filling bonded to backing board, wrapped in covering; each panel fabricated in one piece.
 - i. High-impact, fire resistant, with nailing margins.
 - ii. Flammability: Comply with NFPA 286.
 - iii. Covering: Vinyl-coated polyester fabric, mildew and rot resistant; stapled to back of board.
 - iv. Color: As selected from manufacturer's standard range.
 - v. Texture: Embossed leather-look.
 - vi. Fabric Weight: 14 oz/sq. yd.
 - vii. Foam: Urethane, soft, 3.5 pcf nominal density.
 - viii. Foam: Open cell polychloroprene (Neoprene) 5.5 pcf nominal density.
 - ix. Foam Thickness: 2 inches.
 - x. Backing Board: Plywood.
 - xi. Panel Dimensions: 24 inches wide by 72 inches long, including nailing margins.
 - xii. Mounting: Removable; Z-clips fixed to wall and to padding.
 - xiii. Electrical Outlet Inserts: sized for outlets as required.
- b. Specially Shaped Padding:
 - i. Same construction as standard padding; custom fabricate to fit irregularly shaped members, areas, and protrusions in gymnasium as indicated; provide padding for:
 - (A) Wall corners.

5. Wrestling Mat Storage:

- a. New Mat Hoist: Porter No. 91105-100 "Mini-Mat" Mover with one heavy duty 1 ½ hp, 208 V, 3 phase operator.

6. Bouldering Wall

- a. For elementary schools
- b. Maximum height is 8 feet
- c. Any lumber must be fire-rated
- d. Number of holds provided must be certified by structural engineer

7. Climbing Wall

- a. For middle and high schools
- b. Any lumber must be fire-rated
- c. Number of holds provided must be certified by structural engineer

F. Interior Scoreboards:

1. Basketball, wrestling, and volleyball display, 100 percent solid state electronics.
2. 12-inch high fully lighted LED block numerals, time clock minutes and seconds from 00:00 to 59:59, instant reset to start time for next period, and time clock adjustment up or down by selecting mode; time of day display option.
3. Wall mounted; UL listed; color selected from manufacturer's standards.
4. Provide control cabling, junction boxes, and vibrating horn for each unit.
5. Make: Daktronics, Inc:
 - a. Model: BB-2101-13 PanaView scoreboard.
 - b. Model RC-100 wireless control console.
6. Furnish anchors, trim, and electronic accessories as required for complete, functional installation of each scoreboard system.

G. Playground Equipment:

1. Athletic Equipment for Play Courts:
 - a. Tetherball Posts: JayPro, permanent tetherball post, model #TBP-250. Qty (2). Include balls.
 - b. Basketball:
 - i. Posts: JayPro, 4 ½" diameter post with 4' extension. Qty (3).
 - ii. Backboard: JayPro, aluminum fan, model #ALB-24BT. Qty (3).
 - iii. Goals: JayPro Double Rim Ultimate Breakaway, model #UBG-500F. Qty (3). Include nets.
2. Playground Equipment:
 - a. Provide layout as shown on Contract Documents and Specifications.
 - b. Acceptable manufactures:
 - i. Landscape Structures.
 - ii. Playworld.
 - iii. Freenotes Harmony.
 - iv. Little Tikes – Commercial.

- c. Each apparatus area must include stickers mounted on equipment indicating age appropriateness of play apparatus. Text to be determined during construction.

H. Athletic Equipment:

1. Softball:

- a. Bases: SportsField Specialties, Jack Corbett MLB Hollywood bases, model #LGBBPL. Qty (1 set).
- b. Home Plate: SportsField Specialties, Schnutt Hollywood MLB Universal Pro, model #SHP-UM. Qty (1).
- c. Pitching Rubber: SportsField Specialties, Schnutt Four-Sided Pro, model #SHBBPB. Qty (1).
- d. Foul Poles: SportsField Specialties, 20' foul pole with wing, model #FPW720. Qty (1 set).
- e. Dugouts: Beacon Athletics premium team dugouts, 30' length. Qty (2). Colors: Roof – Mocha Tan, Frame – Black.
- f. Team Benches: Beacon Athletics all aluminum team benches, model #115-445-059. Qty (2) 21' length; (2) 6' length. Portable mount with backrests.

2. Football/ Soccer/ Track

- a. Football Goal: SportsField Specialties original goalkpak high school football/soccer goal system, model #GPKR20HS. Qty (1 set).
- b. Soccer Goal: Upper90 587202 Aluminum soccer goal 8'x24' w/ wheels, anchors, backstays, nets and football goal attachment plates, or equal. Qty (1 set). 800-523-5177.
- c. Trench Drain: ACO System 4000 trench drain with metal ADA compliant grate.
- d. Starting Blocks. Gill 73017712. (Qty 6).
- e. Hurdles: SportsField Specialties 41" collegiate 'L' shaped aluminum hurdle, model #HLCOL41. Qty (60).
- f. Hurdle Carts: SportsField Specialties hurdle cart for 41" 'L' shaped hurdles, model #HLCRT41. Qty (6).
- g. Sand Jump Pit Cover Forms and Lids: SportsField Specialties High School 3M x 7M Sand Pit Cover Set with Base Forms and Cover Ledges. Base Forms and Cover Ledges, model #SPCLHS SP6022, Qty (2). Cover Set, model #SPCVRHS SP6820. Qty (2).
- h. High Jump Standards: Richey AHJ-450 High School Elite Standard. (Qty 1 set).

- i. High Jump Pads: SportsField Specialties JumpZone Challenger high jump pad, model #TFHJ168
 - i. Qty (1). Provide optional model #TFHJ168AWC all-weather cover – Qty (1).
- j. Scoreboard: Daktronics wireless LED, FB-2025 with back light captions and external trumpet horn and All Sport 5100 control console. System requires a 120VAC (20A) line. Qty. (1) Contact Daktronics at 303-762-0183.
- k. Bleachers: Alum-A-Stand non-elevated aluminum bleacher, dull finish. 150-person capacity. Contact Dant Clayton, Carl Muha 800-467-3655 ext. 209. Qty (2). Include anchoring system.
- l. Shotput: SportsField Specialties high school shot put toe board level pad installation, model #SPTBCALHS. Qty (1).
- m. Discus Cage: SportsField Specialties high school discuss cage with optional backup safety net, model #DCHS. Qty (1).

EXECUTION

A. Loading Dock Bumpers:

- 1. Verify that anchor placement is acceptable.
- 2. Install dock bumpers in accordance with manufacturer's instructions.
- 3. Set plumb and level.

B. Residential Appliances:

- 1. Comply with manufacturer's written instructions.
- 2. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and that rough openings are completely concealed.
- 3. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.
- 4. Utilities: Comply with plumbing and electrical requirements.
- 5. Leak Test:
 - a. After installation, test for leaks. Repair leaks and retest until no leaks exist.
- 6. Operational Test:
 - a. After installation, start units to confirm proper operation.
 - b. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.

C. Projection Screens:

1. Install in accordance with manufacturer's instructions.
2. Install front projection screens with screen cases in position and relationship to adjoining construction as indicated, securely anchored to supporting substrate, and in manner that produces a smoothly operating screen with plumb and straight vertical edges and plumb and flat viewing surfaces when screen is lowered.
3. Test electrically operated units to verify that screen, controls, limit switches, closure and other operating components are in optimum functioning condition.

D. Laboratory Equipment:

1. Verify that rough-in frames, anchors and supports are accurately placed.
2. Install in accordance with manufacturer's instructions.
3. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.
4. Touch-up minor damaged surfaces caused during installation. Replace damaged components as directed by architect.
5. Fume Hood:
 - a. Verify equipment rough-in before proceeding with work, including rough opening dimensions required for installation.
 - b. Coordinate with other trades for proper installation of plumbing and electrical services.
 - c. Install in accordance with manufacturer's instructions; comply with requirements of authorities having jurisdiction.
 - d. Install equipment plumb, square, and straight, without distortion, securely anchor.
 - e. Schedule installation to ensure that utility connections are achieved in an orderly and expeditious manner.
 - f. Demonstrate operation to District 20's personnel at completion of installation.

E. Gymnasium Equipment:

1. Take field measurements to ensure proper fitting of work. If taking field measurements before fabrication will delay work, allow for adjustments within recommended tolerances.
2. Inspect areas and conditions before installation. Notify architect in writing of unsatisfactory or detrimental conditions. Do not proceed until conditions have been corrected. Commencing installation constitutes acceptance of work site conditions.
3. Verify that electrical services are correctly located and of the proper characteristics.

4. Install in accordance with contract documents and manufacturer's instructions.
5. Install equipment rigid, straight, plumb, and level.
6. Secure all equipment with manufacturer's recommended anchoring devices.
7. Install wall padding securely, with edges tight to wall and without wrinkles in fabric covering.
8. Separate dissimilar metals to prevent electrolytic corrosion.
9. Protect installed products until Date of Substantial Completion.
10. Replace damaged products before Date of Substantial Completion.

F. Interior Scoreboards:

1. Provide setting drawings, templates, instructions, and directions for installation of scoreboard systems.
2. Install in accordance with manufacturer's instructions.
3. Set units in position plumb, square, level, and properly aligned with other elements of the building and game court layouts as finally approved or installed.
4. Secure to building construction as detailed or required and anchor by welding, bolting, or other suitable means as indicated or as recommended by manufacturer.

G. Playground Equipment:

1. Verify gradients and elevations of base. Verify compaction for all footings and subgrades. Beginning of installation means acceptance of existing conditions.
2. Tack weld tetherball posts to sleeves. Sand, prime and repair finish where damaged by weld.
3. All items must be protected from staining, cracking, chipping, vandalism, and other drainage during progress of the work and left in a first-class condition upon completion.

H. Athletic Equipment:

1. Verify gradients and elevations of base. Verify compaction for all footings and subgrades. Beginning of installation means acceptance of existing conditions.
2. Excavate for footings for athletic structures, and concrete wall. Moisten base, compact to 90% of Standard Proctor Density.
3. Pour footings to the dimensions indicated by the manufacturer using concrete specified under concrete paving. Set any sleeves required to pouring.
4. All footings should be level and even with no bumps, dips, or adverse slopes to affect the placement of the site improvements.
5. Install equipment per manufacturer's specifications.

6. All items must be protected from staining, cracking, chipping, vandalism, and other drainage during progress of the work and left in a first-class condition upon completion.

116143 STAGE CURTAINS

A. Curtains

1. Polyester - Inherently Flame Resistant (IFR)
2. 24 oz Woven Velour
3. 5" Trim Chains
4. Fullness:
 - a. Front – 50% (minimum)
 - b. Rear – 25% (minimum)
5. Noise Reduction Coefficient: .90
6. Sound Absorption Average: .90
7. Made in the USA
8. KM Fabrics – Charisma

B. Track System

1. Track Channel: 12 Ga.
2. Single Carrier: Plated Steel, Neoprene Ball Bearing Carrier, 2-Tired
 - a. (2) Carriers per Foot (Minimum)
3. Master Carrier: Plated Steel, Neoprene Ball Bearing Carrier, 4-Tired
4. Pipe: Schedule 40 (Made in the USA)
5. Pipe Supports: Galvanized
6. Hand Line: Synthetic

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Division 12 – Furnishings

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Division 13 – Special Construction

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Division 14 – Conveying Equipment

142400 HYDRAULIC ELEVATORS:

GENERAL

- A. Coordinate this work with installation of hoistway wall construction.
- B. Coordinate the work with other installers to provide conduits necessary for installation of wiring including but not limited to:
 - 1. To elevator equipment devices remote from elevator machine room.
 - 2. To machine room for telephone service.
 - 3. To elevator pit for lighting and sump pump.
 - 4. To fire alarm panel from controller cabinet.
- C. Coordinate the work with other installers for equipment provisions necessary for proper elevator operation including but not limited to:
 - 1. Shunt trip devices for automatic disconnection of elevator power prior to fire suppression system activation.
 - 2. Overcurrent protection devices selected to achieve required selective coordination.
- D. Preconstruction Meeting:
 - 1. Convene a meeting one week prior to starting work.
 - 2. Review schedule of installation, installation procedures and conditions, and coordination with related work.
- E. Construction Use of Elevator: Not permitted.
- F. Submittals:
 - 1. Product Data: Provide data on the following items.
 - a. Signal and operating fixtures, operating panels, and indicators.
 - b. Car design, dimensions, layout, and components.
 - c. Car and hoistway door and frame details.
 - d. Electrical characteristics and connection requirements.
 - 2. Shop Drawings: Indicate the following information.
 - a. Hoistway Components: Car guide rails, buffers, jack unit and other components.
 - b. Rail bracket spacing; maximum loads imposed on guide rails requiring load transfer to building structural framing.
 - c. Clearances and over-travel of car.

- d. Location and sizes of doors and frames.
 - e. Electrical characteristics and connection requirements.
- 3. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in District 20's name and registered with manufacturer.
- 4. Initial Maintenance Contract.
- 5. Maintenance Contract: Submit proposal to District 20 for standard one-year continuing maintenance contract agreement in accordance with ASME A17.1 and requirements as indicated, starting on date initial maintenance contract is scheduled to expire.
 - a. Indicate in proposal the services, obligations, conditions, and terms for agreement period and for renewal options.
- 6. Operation and Maintenance Data:
 - a. Parts catalog with complete list of equipment replacement parts; identify each entry with equipment description and identifying code.
 - b. Operation and maintenance manual.
 - c. Schematic drawings and wiring diagrams.
 - d. List of special tools required to service elevator.
- G. Quality Assurance:
 - 1. Installer Qualifications:
 - a. Company specializing in performing the work of this Section and approved by elevator equipment manufacturer.
 - 2. Testing Agency Qualifications:
 - a. Independent firm specializing in performing testing and inspections of the type specified in this Section.
 - 3. Products Requiring Fire Resistance Rating:
 - a. Listed and classified by testing agency acceptable to the authorities having jurisdiction.
 - 4. Products Requiring Electrical Connection:
 - a. Listed and classified by testing agency acceptable to the authorities having jurisdiction as suitable for the purpose indicated in construction documents.
 - 5. Source Limitations:
 - a. Provide elevator and associated equipment and components produced by the same manufacturer as the other elevator equipment used for this project and obtained from a single supplier.

6. Basis of Design:

- a. Contract Specifications and Drawings are based on elevators and equipment by the specified basis of design manufacturer. Elevators manufactured by other acceptable manufacturers are permitted, subject to compliance with specified requirements, and provided that deviations in dimensions, configurations, function, and profile are minor, and do not detract substantially from the indicated design intent.

H. Warranty:

1. Provide 24-month manufacturer warranty for elevator operating equipment and devices from Date of Substantial Completion.

PRODUCTS

A. Hydraulic Elevators:

1. Hydraulic Elevator Equipment:

- a. Holeless hydraulic with cylinder mounted within hoistway, machine room type.
- b. The use of Machine Less Room (MRL) type elevators is prohibited.

2. Interior Car Height: 96 inch.

3. Cab Design: Basis of Design Manufacturer's standard, including the following optional features.

- a. Ceiling: LF-1, satin stainless steel with square LED lighting.
- b. Walls: Brushed stainless steel panels.
- c. Handrails: 1.5-inch round, satin stainless steel finish.
- d. Cab Interior Exposed Metals: Satin stainless steel.
- e. Flooring: Porcelain ceramic tile flooring.
- f. Signalization: KSS 140 vandal-resistant flush signalization.
- g. Keypad or card reader call stations.
- h. Key elevator call button to building master key.

4. Emergency telephone.

- a. Provide vandal-resistant telephone set with emergency pushbutton dialer, and "hands free" use for microphone/speaker concealed behind perforated panel-mounted.

5. Keys:

- a. Provide three (3) sets of elevator keys to District 20, including:
 - i. Cab hall call key.
 - ii. Hostway vent key.

- iii. Fire recall key.
 - iv. Custodial override (run/stop) key.
 - v. Pit access key.
 - b. A keyed switch labeled "Hostway Vent" located adjacent to Fire Department switch at primary level.
 - i. Keyed switch shall be rotating type only.
 - 6. Electrical Power: Per Contract Documents and Specifications.
 - 7. Rated Net Capacity: 3500 lbs.
 - 8. Rated Speed: 150 ft per minute.
 - 9. Hoistway Size: As indicated on the Contract Documents and Specifications.
 - 10. Interior Car Platform Size: As indicated on the Contract Documents and Specifications.
 - 11. Elevator Pit Depth: As indicated on the Contract Documents and Specifications.
 - 12. Overhead Clearance at Top Floor: As indicated on the Contract Documents and Specifications.
 - 13. Travel Distance: As indicated on the Contract Documents and Specifications.
 - 14. Number of Stops: As indicated on the Contract Documents and Specifications.
 - 15. Number of Openings: One Front.
- B. Components:
- 1. Motors, Hydraulic Equipment, Controllers, Controls, Buttons, Wiring, Devices, and Indicators: Comply with NFPA 70.
 - 2. Guide Rails, Cables, Buffers, Attachment Brackets and Anchors: Design criteria for components includes safety factors in accordance with applicable requirements of Elevator Code; ASME A17.1.
 - 3. Buffers:
 - a. Spring type for elevators with speed less than 200 ft per minute.
 - 4. Lubrication Equipment:
 - a. Provide grease fittings for periodic lubrication of bearings.
 - b. Lubrication Points: Visible and easily accessible.
- C. Operation Controls:
- 1. Elevator Controls: Provide landing operating panels and landing indicator panels.
 - a. Landing Operating Panels: Metallic type, one for originating "Up" and one for originating "Down" calls, one button only at terminating landings; with illuminating indicators.

- b. Landing Indicator Panels: Illuminating.
 - c. Comply with ADA Standards for elevator controls.
- 2. Interconnect elevator control system with building fire alarm and smoke alarm systems.
- 3. Door Operation Controls:
 - a. Program door control to open doors automatically when car arrives at floor landing.
 - b. Render "Door Close" button inoperative when car is standing at dispatch landing with doors open.
 - c. Door Safety Devices: Moveable, retractable safety edges, quiet in operation; equipped with photo-electric light rays.
- 4. Provide "Firefighter's Emergency Operation" in accordance with ASME A17.1, applicable building codes, and authorities having jurisdiction (AHJ).
 - a. Designated Landing: Main Lobby.

D. Operation Control Type:

- 1. Single Automatic (Push Button) Operation Control: Applies to car in single elevator shaft.
 - a. Refer to description provided in ASME A17.1.
 - b. Set system operation so that momentary pressure of landing button dispatches car from other landing to that landing.
 - c. Allow call registered by momentary pressure of landing button at any time to remain registered until car stops in response to that landing call.
 - d. If elevator car door is not opened within predetermined period of time after car has stopped at terminal landing allow car to respond to call registered from other landing.
 - e. Keypad hall call stations.

E. Emergency Power:

- 1. Set-up elevator operation to run with elevator emergency power supply when the normal building power supply fails.
- 2. Elevator Emergency Power Supply: Elevator system components that provide battery-based elevator power supply.
- 3. Emergency Lighting: Comply with ASME A17.1 elevator lighting requirements.
- 4. Provide operational control circuitry for adapting the change from normal to emergency power.

5. Upon transfer to emergency power, advance one elevator at a time to a pre-selected landing, stop car, open doors, disable operating circuits, and hold in standby condition.
- F. Performance Requirements:
1. Regulatory Requirements: Comply with ASME A17.1, applicable local codes, and authorities having jurisdiction (AHJ).
 2. Accessibility Requirements: Comply with ADA Standards.
 3. Perform structural steel design, fabrication, and installation in accordance with AISC 360.
 4. Perform welding of steel in accordance with AWS D1.1/D1.1M.
 5. Fabricate and install door and frame assemblies in accordance with NFPA 80 and in compliance with requirements of authorities having jurisdiction.
 6. Perform electrical work in accordance with NFPA 70.
 7. Comply with fire protection sprinkler system of the hoistway design in accordance with NFPA 13 requirements and authorities having jurisdiction.

EXECUTION

- A. Provide District 20 with all required specialized tools to service unit (i.e.: access controllers, etc.).
- B. Verify existing conditions before starting this work.
- C. Verify that hoistway, pit, and machine room are ready for work of this Section.
- D. Verify hoistway shaft and openings are of correct size and within tolerance.
- E. Verify location and size of machine foundation and position of machine foundation bolts.
- F. Verify that electrical power is available and of correct characteristics.
- G. Arrange for temporary electrical power for installation work and testing of elevator components.
- H. Install system components and connect equipment to building utilities.
- I. Provide conduit, electrical boxes, wiring, and accessories.
- J. Install hydraulic piping between cylinder and pump unit.
- K. Mount machines, motors, and pumps on vibration and acoustic isolators, on bed plate and concrete pad.
 1. Securely fasten to building supports.
 2. Prevent lateral displacement.
- L. Install guide rails to allow for thermal expansion and contraction movement of guide rails.

- M. Accurately machine and align guide rails, forming smooth joints with machined splice plates.
- N. Field Welds: Chip and clean away oxidation and residue with wire brush; spot prime surface with two coats.
- O. Install hoistway door sills, frames, and headers in hoistway walls; grout sills in place, set hoistway floor entrances in alignment with car openings, and align plumb with hoistway.
- P. Fill hoistway door frames solid with grout in accordance with the Contract Documents and Specifications.
- Q. Structural Metal Surfaces: Clean surfaces of rust, oil or grease; wipe clean with solvent; prime two coats.
- R. Adjust equipment for smooth and quiet operation.
- S. Guide Rail Alignment: Plumb and parallel to each other in accordance with ASME A17.1 and ASME A17.2.
- T. Car Movement on Aligned Guide Rails: Smooth movement, without any objectionable lateral or oscillating movement or vibration.
- U. Testing and inspection by regulatory agencies certified in accordance with ASME QEI-1 will be performed at their discretion.
 - 1. Schedule tests with agencies and notify District 20 and architect.
 - 2. Obtain permits as required to perform tests.
 - 3. Document regulatory agency tests and inspections in accordance with requirements.
 - 4. Perform tests required by regulatory agencies.
 - 5. Furnish test and approval certificates issued by authorities having jurisdiction.
- V. Adjust for smooth acceleration and deceleration of car so not to cause passenger discomfort.
- W. Adjust with automatic floor leveling feature at each floor landing to reach 1/4 inch maximum from flush with sill.
- X. Provide Initial Maintenance Contract of elevator system and components in accordance with ASME A17.1 and requirements as indicated for 3 months from Date of Substantial Completion.
- Y. Submit proposal for continuation of Maintenance Contract in accordance with ASME A17.1 and requirements as indicated for installed elevator equipment.
- Z. Perform maintenance contract services using competent and qualified personnel under the supervision and direct employ of the elevator manufacturer or installer.
- AA. Maintenance contract services shall not be assigned or transferred to any agent or other entity without prior written consent of District 20.

- BB. Include systematic examination, adjustment, and lubrication of elevator equipment. Maintain and repair or replace parts whenever required using parts produced by the original equipment manufacturer.
- CC. Perform work without removing cars from use during peak traffic periods.
- DD. Provide emergency call back service within 4 hours of initial notification throughout period of this maintenance contract.

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Division 21 – Fire Suppression

210500 COMMON WORK REQUIREMENTS FOR FIRE PROTECTION

GENERAL

- A. New buildings shall be fully fire-sprinkled in accordance with IBC, IFC, NFPA, and CSFD requirements.
- B. Additions to buildings with existing fire sprinkler systems shall be fully fire-sprinkled in accordance with IBC, IFC, NFPA, and CSFD requirements.
- C. Systems shall be designed by Fire Protection engineer with a valid Colorado Professional Engineer designation.
- D. All piping and fittings shall be manufactured in the USA.
- E. All piping and fittings shall be a minimum of Schedule 40.
- F. Provide a ball valve shut-off at each pressure gauge.
- G. Prior to beginning work inspect and test all existing systems that will be affected by the work in this contract. Provide a report to Academy School District 20 Project Manager indicating any problems or defects found. If no problems or system defects are submitted, the contractor shall be responsible for correcting problems found at the completion of the project that are determined to be caused by the work of this contract.
- H. Inspect the entire work area for defects in the existing construction such as scratches, holes etc. Submit a complete list and photographs of existing damage, to Academy School District 20 Project Manager prior to beginning work. If existing damage is not documented the contractor shall repair all damage to like new condition, that is determined to have been caused by the work in this contract.
- I. Academy School District 20 Project Manager shall determine if the contractor has damaged existing systems or construction and approve the repairs.
- J. The design of the fire protection system shall be performed by or under the direct supervision of an experienced fire sprinkler design professional having NICET III or higher-level certification. Said professional shall be experienced in fire protection, thoroughly familiar with and experienced in this type of installation. Colorado registered Professional Engineers who are “Members” in the national organization of the Society of Fire Protection Engineers (SFPE) are preferred.
- K. System design engineer and contractor shall have five (5) years minimum experience on projects equal to or greater in size of subject project.
- L. Avoid design and placement of main lines, branch lines, or heads near combustion air inlets or other areas that may be subject to freezing. The contractor shall be responsible for advising District 20 and/or architect of any conditions that may require dry pipe systems, antifreeze systems, or provision of heating systems to prevent freezing of wet pipe sprinkler systems.
- M. Fire sprinkler piping shall be clearly labeled as such and shall be routed above drop ceilings in corridors when possible. Efforts should be made to avoid or minimize routing of main lines through classrooms and stairwells. Any piping crossing corridors or stairwells shall be above ceiling or enclosed in a soffit constructed of metal framing and gypsum board. If it is impossible to conceal sprinkler piping above ceilings or in

soffits, any exposed piping and fittings must be painted. Sprinkler piping may be routed through existing mechanical tunnels or unfinished basement areas if necessary.

- N. Fire sprinkler mains should be located along the perimeter of classroom walls when possible. Sprinkler heads should be located such that they will not conflict with existing ceiling grid assemblies. Sprinkler heads do not need to be centered in ceiling tiles but must be a minimum of 4" away from grid mains or tees. Any exceptions must be stated in proposal and must be pre-approved by Academy School District 20 Project Manager in writing prior to installation. The contractor shall indicate head placement on reflected ceiling plan as part of shop drawing submittal.
- O. System shall be designed and installed to avoid conflicts with structural elements, existing windows, transfer grilles, clocks, speakers, outlets, ceiling fans, lighting fixtures, conduit runs, data cabling, existing and new mechanical equipment, maintenance access panels, and all other existing conditions. Coordinate all fire sprinkler work with the work of other trades.
- P. Modifications to the existing fire alarm panel and enunciator shall be performed under this contract as required for interface with new sprinkler system.
- Q. System design shall include fire sprinkler risers and standpipes to each floor of the building as required by the IFC, NFPA and CSFD. Each floor shall have a separate control valve and zone.
- R. Shop drawings shall be submitted to Academy School District 20 and/or architect for review prior to submission to CSFD & CODPS. The contractor shall prepare and submit necessary calculations, drawings and specifications to CSFD & CODPS and follow through with the reviews and approval process to include facilitating any required plan and specification modifications. Before work commences, the contractor shall provide the Academy School District 20 Project Manager with copies of all approved drawings.
- S. Corrections or comments made on the Shop Drawings during the review do not relieve the contractor from compliance with requirements of the drawings and specifications. The contractor is responsible for confirming and correcting all quantities; checking electrical characteristics and dimensions; selecting fabrication processes and techniques of construction; coordinating his work with that of all other trades; and performing his work in a safe and satisfactory manner.
- T. Before construction work commences, contractors for all trades shall submit Coordination Drawings in the form of reproducible transparencies drawn at not less than 3/8" = 1'-0" scale. Coordination Drawings are required throughout all areas for all trades. These drawings shall identify and show resolutions of trade conflicts. Mechanical Equipment Rooms shall be drawn early in the Coordination Drawing process, simultaneous with all other congested areas.
- U. Contractor and/or design engineer shall be responsible for verifying current flow rates, available pressure, and other information necessary to design a fire suppression system from the City of Colorado Springs Utilities and/or Fire Departments. If a flow test is required, testing method shall be in accordance with CSFD standards. The contractor to notify representatives from CSFD and Academy School District 20 Project Manager when flow test is scheduled and shall provide an opportunity for testing to be witnessed by representatives from CSFD or Academy School District 20.
- V. Contractor and/ or design engineer shall verify adequacy of existing underground fire service line and City water connection for use as water supply for new fire suppression system and shall include cost of any modifications (if required) in their proposal.

- W. Design engineer shall perform calculations during system design to conclude if a booster pump is required for the Fire Suppression system.
 - X. If required, the contractor shall include the complete installation of a booster pump for the Fire Suppression system. The contractors shall include all construction permit, inspection, testing and plan review fees.
 - Y. If required, the contractor shall provide and install a surface mounted KNOX BOX conforming to CSFD standards to store keys for emergency building access. Location of installation to be mutually acceptable by Academy School District 20 Project Manager and CSFD.
- | | |
|--|------------------------|
| PIPE SERVICE | IDENTIFICATION / LABEL |
| Fire Protection – Mains | FIRE PROTECTION WATER |
| Fire Protection - Wet Sprinkler | SPRINKLER - WATER |
| Fire Protection - Dry Sprinkler | SPRINKLER - DRY SYSTEM |
| Fire Protection - Wet Standpipe | WET STANDPIPE |
| Fire Protection - Dry Standpipe | DRY STANDPIPE |
| Fire Protection - Chemical (FM-200, CO2, etc.) | SPRINKLER – CHEMICAL |
- Z. Provide acrylic plastic strap-on type markers, UV resistance. Seton “Setmark” snap-on wrap around type pipe markers or equivalent.
 - AA. Provide signs at each alarm check, and each dry pipe valve, to clearly indicate hydraulic calculation data.

210523 FIRE HYDRANTS

GENERAL

- A. Fire Hydrants shall be Mueller Co.: Super Centurion Series
 - 1. Provide insulation valve with curb box for each hydrant.
 - 2. Provide required thrust blocks and anchoring as required by applicable codes.
 - 3. Provide flow-test for each fire hydrant installed.
 - 4. Hydrant color shall be per CSFD standards.

210523 VALVES FOR FIRE SUPPRESSION

GENERAL

- A. Locate valves with stems at or above horizontal positions and swing check valves in horizontal position only.
- B. Provide hose threaded drain valves at all system low points and as called for. Provide drain valves at all elevation changes. In addition to these requirements, provide where specifically indicated on the drawings.
- C. Standard brass valve tags, 2" diameter with ½" high numerals. Identify all plumbing services with ¼" letters above the valve number ("FP"). Attach to valves using brass "jack" chain and brass "S" hook.
- D. Provide valve chart for all valves provided as part of project. Frame and place under clear glass. Hang in mechanical room or in location as directed by District 20.
- E. UL listed and FM approved and labeled for intended fire protection service. Sprinkler systems 175 psi wwp.

- F. Working pressure stamped or cast on bodies per MSS SP-25.
- G. Stem packing serviceable without removing valve from line and shall be free of asbestos.
- H. Gate Valves:
 - 1. 2-1/2 inch and larger: OS&Y pattern. IBBT, flanged ends, 200 psi wwp, resilient wedge disc, Stockham #G-610.
- I. Butterfly/Ball Control Valves with Provision Tamper Switch:
 - 1. General: Iron or bronze body.
 - a. 2 inch and smaller: NIBCO KT-505-W-8 or Watts LFAFBV-FP.
 - b. 2-1/2 inch and larger: Grinnell BFV-300 or Gruvlok.
- J. Check Valves:
 - 1. General: Swing type rubber faced.
 - a. 2 inch and smaller: Bronze body, threaded ends, Grinnell #3315.
 - b. 2-1/2 inch and larger: IBBM, flanged or grooved ends, Grinnell #780FP.
- K. Trim, Drain and Test Valves: Ball, plug, angle or globe type, bronze body, threaded ends, UL listed.
- L. Valves for Gauges and Instruments:
 - 1. 1/4-inch size: Brass bar stock for 1000 psi and 300 Deg. F; Watts: LFFBV-3C ball valve.
- M. Underground Valves:
 - 1. Curb Valves 2 inch and Smaller:
 - a. Mueller H-15201, 175 lb. wp brass plug valve, one quarter turn with check, solid teehead "O" ring seal, flared copper ends - AWWA C800-66 threads.
 - 2. Gate Valves 3 inch and Larger:
 - a. Iron body inside screw-in bronze trim; wedge disc; resilient seat; "O" ring seals; 175 psi wwp; open counter-clockwise; 2-inch square wrench nut; mechanical joint ends; AWWA C509.
 - 3. Fire protection service: UL listed and FM approved; Kennedy Ken-Seal Fig. 1071X with adjustable indicator post, wrench, case hardened brass padlock and keys.
 - 4. Curb Boxes:
 - a. Cast iron with adjustable steel riser, stationary rod and cover extended from the valve to finish grade. Provide curb box with each curb valve.
 - 5. Valve Boxes:
 - a. Cast iron adjustable screw type box and cover extending from the valve to finish grade. Cast arrow and lettering on cover of box denoting direction of valve opening and service. Provide with each gate valve.
 - 6. Valve Key:
 - a. Steel socket key for gate valve or curb valve.

7. Post Indicator Valve Assembly:

- a. Butterfly type: UL/FM for fire protection service only; sufficient shaft length for top of valve to be approximately 36 inch above finished grade. Mechanical joint ends, with case hardened brass padlock and keys.
- b. Make: Kennedy, Pratt or Mueller.

N. Hose Thread Drain Valves:

1. Bronze body with 2-piece standard port ball valve. Female NPT x 3/4-inch hose end, brass cap and chain, 200 psi WOG.
2. Make: Watts B-6000-CC.

211313 FIRE PROTECTION SYSTEM, AUTOMATIC WET-PIPE SPRINKLER

PRODUCTS

PIPING MATERIAL

- A. All piping and fittings shall be manufactured in the USA.
- B. All piping and fittings shall be a minimum of Schedule 40.
- C. Materials shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less, in accordance with NFPA 255.
- D. CPVC piping is prohibited.
- ~~E.~~ Fittings shall be rated for 250 psi for Fire Systems with Standpipes or Fire Pumps; otherwise, 175 psi is acceptable.
- F. All piping to have corrosion ratio of 1. Threaded or cut groove pipes are subject to limitations of NFPA 13. Grooved coupling fittings are acceptable; however, threaded fittings are preferred in architecturally exposed or sensitive areas.
- G. All pipe joining, fittings, and supports shall comply with NFPA 13 requirements.
- H. Grooved couplings, fittings, and gaskets used throughout the system shall be supplied from the same manufacturer and shall be approved for the specific installation.
- I. Segmentally welded piping shall not be used in any condition unless pre-approved by Academy School District 20 Project Manager and Authority Having Jurisdiction (AHJ).
- J. Dielectric waterways or brass nipples shall be provided between steel coupling and copper couplings. Face bushings and hexagonal bushings shall not be permitted.
- K. The use of toggle bolts for suspension shall not be permitted.
- L. Hanger components shall be installed straight and true. Hangers shall be attached to the supporting structure by means of approved beam clamps, all thread, mounting plates, brackets, clips, bolts, or concrete anchors. All hangers and components shall be galvanized.
- M. Provide Metallic Detection Tape for all underground fire service and fire suppression piping. Provide 6" wide tape.

SPRINKLER HEADS

- A. System shall be designed utilizing Viking or equal “quick response” sprinkler heads. System may be designed with sprinkler heads providing standard coverage or extended coverage as permitted by applicable codes and deemed appropriate for efficiency of system design. Brass or bronze, 1/2-inch orifice, 1/2-inch NPT. 155°F ordinary temperature classification. Use 200°F and 286°F temperature classifications where needed.
- B. System shall be designed such that all sprinkler heads are a minimum of nine (9) feet above finish floor when possible. System designer to make specific note on shop drawings of any heads that may be located less than 9’ above finish floor.
- C. Sprinklers subject to damage in all areas, rooms, closets, corridors, etc. and/or any sprinkler heads lower than 9’ above finish floor shall be provided with caged guards unless requirement is waived in writing by Academy School District 20 Project Manager.

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Division 22 – Plumbing

220500 COMMON WORK RESULTS FOR PLUMBING

GENERAL

- A. Provide dual direction cleanouts for servicing of lines and equipment including adequate clean out access.
- B. Coordinate with Academy District 20 Project Manager and architect for occupant load to determine number and size of fixtures and requirements necessary for Food Service operations.
- C. Domestic water piping shall not be installed in areas subject to freezing: Combustion air intakes, exterior walls, unconditioned crawls spaces and unconditioned attic spaces.
- D. Roof leaders/downspouts shall not be concealed in exterior chases or ceiling cavities. Exterior routed leaders/downspouts shall be fully accessible.
- E. Wall hydrants shall be provided with a drain down leg and dedicated shut-off for winterizing. Also provide a 24"x24" access panel.
- F. All work and materials shall conform to and be installed, inspected and tested in accordance with the governing rules and regulations of federal, state and local governmental agencies.
- G. Any product designed for dispensing potable water shall meet both the NSF 61 and NSF 372 test standards via third-party testing and certification.
- H. Use of existing equipment for temporary heating or cooling: do not use new or existing building equipment without written permission from District 20.
- I. Do not cover up or enclose work until inspected, tested, and approved. Any work enclosed or covered up before such approval shall be uncovered, tested, and approved.
- J. Equipment shall conform to state and/or local energy conservation standards.
- K. Comply with rules and regulations of local utility companies. Include cost of valves, valve boxes, meter boxes, meters, accessory equipment required for project.
- L. It is the intent of the Final Construction Documents and Specifications to result in a complete mechanical/plumbing installation in accordance with all applicable local codes and ordinances.
- M. Drawings are diagrammatic in character, and do not necessarily indicate every required pipe, offset, transition, etc. Items not specifically mentioned in the specification or noted on the drawings, but which are necessary to make a complete working installation, shall be included.
- N. Contractor shall coordinate with all District 20 supplied equipment prior to rough-in. Ensure all equipment connections are provided for and that the installation will meet all local and national code requirements.

UTILITY CONNECTIONS

- A. The design team and/or contractors shall be responsible for determining requirements for local utility providers including submittal documents, taps, fees and licenses, meters, pressures, etc. design team and/or contractor will determine required meter locations, requirements for separate taps or combined taps, and other specific requirements of all local utility providers for each project and coordinate with Academy School District 20 Project Manager for final approval prior to installation.
- B. The Academy District 20 Project Manager will pay applicable water and wastewater development fees as required by municipality for new construction or site development. The contractors shall coordinate and pay for physical tap fees and inspections unless noted otherwise in contract documents.
- C. Water meter pit and meter for domestic (potable) water shall normally be separate from meter pit and meter for irrigation water. Provide service valves in each meter pit. Do not increase tap size for irrigation needs. Provide for digital metering of water consumption.
- D. Make direct contact with utility companies to determine piping, valve, pressure reduction and meter requirements. Determine water pressure available at the site prior to design.
- E. Local utility provider charges for work on the property shall be included in the construction Contract, when possible. Other charges will be reviewed with the Academy District 20 Project Manager and further negotiated by the District.
- F. Storm drainage systems that rely on mechanical pumping systems shall not be permitted unless approved by Academy District 20 Project Manager.
- G. All domestic cold water, domestic hot water and gas piping, where exposed to view and above accessible ceilings shall be identified by as follows:

<u>PIPE SERVICE</u>	<u>IDENTIFICATION / LABEL</u>
Domestic Cold Water	DOMESTIC COLD WATER
Domestic Hot Water	DOMESTIC HOT WATER
Domestic Hot Water Re-circulation	DOMESTIC HOT WATER RETURN
Cooling or Process Water	NONPOTABLE WATER
Pure Water	PURE WATER
Natural Gas	NATURAL GAS
Compressed Air (Laboratory, Shop or Inst.)	COMPRESSED AIR
Compressed Air (Medical and Patient Use)	MEDICAL AIR
Vacuum (Laboratory or Shop)	VACUUM
Sanitary and / or Waste	SANITARY DRAIN
Plumbing Vent	SANITARY VENT
Acid Waste	ACID WASTE
Acid Vent	ACID VENT
Storm	STORM DRAIN
Indirect Waste	INDIRECT WASTE

- H. Provide acrylic plastic wrap-around type markers with directional flow arrows, UV resistance and legend printed four (4) times for 360-degree visibility. Provide Seton Setmark or approved equal.
- I. Provide Metallic Detection Tape for all underground storm and sanitary sewers, natural gas lines and water piping. Provide 2" wide tape, 0.035". Make: Seton style 37000 series 2-inch tape for burial 4 inches to 6 inches below surface, style 37000 series 6-inch tape for burial deeper than 6 inches.
- J. Directional flow arrows shall be included with the color code, taped on the pipe or insulation at 15'-0" intervals.
- K. All color coding shall be in accordance with the latest issue of the ASME (ANSI) standard A13.1 recommendations, based on the "contents" of the piping.
- L. Provide valve tags for all valves provided on project and install where they can be seen and read without difficulty.
- M. Standard brass valve tags, 2" diameter with 1/2" high numerals. Identify all plumbing services with 1/4" letters above the valve number ("PLBG."). Attach to valves using brass "jack" chain and brass "S" hook.
- N. Provide valve chart for all valves provided as a part of this project. Frame and place under clear glass. Hang in Mechanical Room or in location as directed by the District 20.
- O. Provide engraved vinyl plates for each major piece of plumbing equipment provided.
- P. Nameplates: 3/4" x 2-1/2", Seton Cat. #2060-20 or approved equal.
 - 1. Scratch-resistant, non-static, high pressure laminate with contrasting inner core color.
 - 2. Finish and Color: As selected from manufacturer's standard colors and finishes, unless otherwise indicated.
 - 3. Exposed Engraved Inner Core: White, unless otherwise indicated.
 - 4. Thickness: 1/8 inch, unless otherwise indicated.
 - 5. Engraved Process: Machine engraved letters, numbers, symbols, and other graphic devices to produce precisely formed copy indented to a uniform depth with sharply formed edges.
 - 6. Engrave copy through the exposed face ply to expose the core ply.

221116 DOMESTIC WATER PIPING

GENERAL

- A. All domestic water piping and fittings shall be manufactured in the USA.
- B. All underground piping including services shall be type "K" copper. Joints under slabs shall not be permitted. Minimum cover shall be 5'-0" outside of the building foundation.
- C. Protect domestic water supply from freezing. Exercise care to avoid outdoor air intakes, combustion air dampers, garage doorways, or other external freeze exposures.
- D. All main water service and irrigation lines shall enter the building through heated mechanical rooms. No pit or tunnel installations will be permitted for new construction.

- E. Where exposed piping passes through walls, floors, roofs, provide chrome plated or stainless-steel escutcheon for piping.
- F. Cold water and hot water piping shall be independently supported of each other.
- G. The use of PEX piping and fittings is prohibited.
- H. The use of "Sharkbite" fitting is prohibited.
- I. The use of "Propress" fittings is prohibited.
- J. The use of "Victualic" fittings is prohibited.
- K. The use of "Pulled T's" at branch piping is prohibited.

PRODUCTS

PIPING

- A. Piping within building shall be Type K copper with lead free solder joints.
- B. Galvanized steel piping is not permitted.
- C. All piping to be above grade or in accessible trench.
- D. Avoid placement of piping in exterior walls. Make sure that any piping above ceilings is on room side of insulation and adequately protected from freezing.
- E. Install piping to allow for expansion and contraction without stressing piping joints or connected equipment. Mechanical expansion devices shall not be used without District approval.

FITTINGS

- A. Provide dielectric fittings where any dissimilar metals join. Avoid the use of dielectric unions when possible, utilize dielectric nipples.

INSULATION

- A. Insulation thicknesses shall meet the requirements of the International Plumbing Code (Latest Edition).
- B. Insulation and all materials on the interior and exterior surfaces of ducts, pipes, and equipment shall have a composite fire and smoke hazard rating not exceeding: Flame spread - 25; fuel contribution - 50; smoke developed - 50, as determined in accordance with ASTM Standard E-84. All insulation materials used for valves and fittings shall have the same ratings as the pipe insulation. Information must be submitted by means of manufacturer's literature showing that the proposed materials conform to above specification without exception.
- C. Fiberglass pipe insulation shall be rigid molded and non-combustible with 'K' factor of 0.23 at 75°F. Jacket shall be all service (ASJ) vapor barrier jacket with white kraft paper reinforced with glass fiber yarn and bonded to aluminum foil, secured with self-sealing longitudinal laps and butt strips. Johns Manville 'Micro-Lok' or equivalent.
- D. Hydros Calcium Silicate insulation shall be rigid molded, non-combustible per ASTM E 136, conforming to ASTM 533, asbestos-free with 'K' factor of 0.40 at 300°F., maximum service temperature 1200°F., compression strength (block) minimum of 200 PSI to produce 5% compression at 1-1/2" thickness. Johns Manville 'Thermo-12 Gold' or equivalent.
- E. Fiberglass rigid board insulation for equipment shall conform to ASTM C612 with 'K' factor of 0.23 at 75°F, R=8.0 minimum, 3.0 pound per cubic foot density. Provide vapor barrier jacket (FSK) with aluminum foil reinforced with fiberglass yarn and laminated

to fire-resistant kraft, secured with UL listed pressure sensitive tape and outward clinched expanded staples and vapor barrier mastic. Johns Manville 'Spin-Glas' or equivalent.

- F. Elastomeric foam insulation for piping and equipment shall be flexible, cellular, molded or sheet, conforming to ASTM C534, with 'K' factor of 0.28 at 75°F., maximum service temperature of 220°F., maximum flame spread rating of 25 and maximum smoke development rating of 50 (3/4" thickness and less). Connections shall be made using manufacturer's approved waterproof vapor barrier retarder adhesive. Provide outdoor U.V. protective coating on all insulation exposed to ambient conditions, including one layer of alumiclad piping protection wrap.

METAL JACKETING

- A. Metal jacket shall be 0.016-inch smooth embossed aluminum. Provide moisture barrier lining for service temperatures 60°F and less except where applied over insulation with All Service Jacket (ASJ) vapor barrier jacket. Aluminum jacketing shall be installed where specified herein or otherwise indicated on the Contract Documents and Specifications.
- B. Provide where piping is exposed in occupied areas 9'-0" AFF and below.

PVC JACKETING

- A. PVC jacketing shall be Zeston 2000 or equivalent, gloss white, 0.030-inch thickness, minimum, and shall have a composite fire and smoke hazard rating not exceeding: flame spread -25; smoke development -50.
- B. Connection shall be made using tacks and pressure sensitive color matching vinyl tape.
- C. Seams shall be on the bottom side of pipe and fittings.
- D. Provide through floor piping support documentation.

PIPING HANGERS AND SUPPORTS

- A. Cold water and hot water piping shall be supported independently of each other.
- B. All insulated piping systems shall be provided with individual hangers sized to encircle the insulation.
- C. Hangers for domestic cold water and roof drains shall be installed with thermal hangers shields, i.e.: Calsil Blocks, and sealed properly to adjoining insulation to establish a vapor barrier to prevent the formation of condensation.
- D. Insulated piping supported by means of trapeze hangers or roller type hangers shall not rest directly on the hanger or support.
- E. The insulation at hangers, trapezes and supports shall be protected by means of galvanized steel insulation half diameter support shields. Provide insulation insert between support shield and piping for piping size 1" and larger. Insulation inserts shall be heavy density calcium silicate molded insulation. Insulation inserts shall be the following minimum lengths. Factory fabricated thermal pipe shield as manufactured by Pipe Shields, Inc.
- F. Hanger spacing shall comply with the International Plumbing Code (Latest Edition).

GAUGES

- A. Pressure Gauges:
 - 1. 2.5-inch glycerin filled, SS case, 1.5% accuracy, dual scale (PSI & KPA), bronze bourdon tube and 0.25-inch NPT connection, brass snubber with properly

selected filter disc for the application, and ball valve. Provide multiple ball valves where a single pressure gauge is used to measure pressure at multiple points.

2. Provide drain and vent valves to facilitate removing air and water from the sensing line.
3. Provide flow measure device and thermometer specifications.

B. Temperature Gauges:

1. Either liquid filled or digital type, vari-angle, 3-1/2" stem for pipe sizes through 6" and 6" stem for pipe sizes 8" and larger, dual scale (degrees F & C), stainless steel thermowell, extension neck where installed in insulated piping, and accuracy 1% of range.
 - a. Liquid Filled Type: 9" case, straight form, V-shaped, high pressure die cast aluminum, baked enamel finish, with heavy glass-protected front firmly secured with spring action, and organic liquid filled magnifying lens. Winters 9IT or approved equal.
 - b. Digital Type: May be used both indoors or in outdoor locations not exposed to sunlight, high impact ABS plastic housing, suitable for operation at 16 Lux. Winters TSD or approved equal.
- C. Select range as indicated on the drawings, or if not indicated select so that the normal Operating range is approximately 50% of the scale range.

SHOCK ABSORBERS

- A. Provide shock absorbers for all piping service flush valves.
- B. Provide isolation valves at each shock absorber for servicing.
- C. Provide 24"x24" access panel at each shock absorber.

DOMESTIC HOT WATER GENERATING EQUIPMENT

- A. Boilers and tanks shall be sized as required for storage and recovery rates. Tanks shall be glass lined and carry a 5-year warranty. Provide separate loop with equal to or greater than 160-degree water to the kitchen dishwasher rinse cycle and temper to 140 degrees for kitchen sinks. Design separate building loop; and deliver 110-degree water to the rest of the building. Provide tempering valves at fixtures in accordance with State & Local standards and health department regulations.
- B. Boilers with "Swing-Arm" heating capabilities may be utilized. Review application with ASD 20 Project Manager prior to proceeding.
 1. Lochinvar – Armor Series or approved equal.
- C. Tank-Type water heaters shall be high efficiency style and sized as required for storage and recovery rates.
- D. Instantaneous gas-fired water heaters may be considered for energy efficiency. Review application with Academy School District 20 Project Manager prior to proceeding.
- E. Use brass/ dielectric nipples and unions on water heaters.
- F. Provide pumped recirculation system. Pump shall be bronze construction with wet-rotor design.
 1. Grundfos – UPS VersaFlo Series.

VALVES

- A. Pressure reducing valves shall be Cla-Val model 90-01 or approved equal.
- B. Isolation valves shall be ball valves with stainless steel ball & stem trim; bodies shall be made of lead-free materials.
- C. The use of gate or butterfly valves is prohibited.
- D. Provide isolation valves at all main branches and for all fixture groups. All unions for the isolated equipment to go after valve on supply and before valve on return. Balancing valves shall not be used as isolation valves.
- E. Provide dedicated isolation valve for wall hydrants. Also provide drain-down-leg for dedicated piping serving wall hydrant.
- F. Drain valves shall be ball valves with hose end adapters with cap & chain.
- G. Provide balance valves/ circuit setters where required and/ or called for on contract documents. Valves shall be Lead Free Certified to NSF 372.
 - 1. Makes:
 - a. Bell & Gossett "Circuit Setter."
 - b. Armstrong "CBV."
 - c. Tour & Andersson "TA Series."

BACKFLOW PROTECTION

- A. Backflow preventers installed on main domestic water service lines shall be a minimum of 3" and shall have an additional 1-1/2" bypass backflow device.
- B. If service size warrants a larger backflow preventer, bypass device shall be ½ the size of the main backflow device.
- C. All backflow devices shall be manufactured by Febco and shall be installed in a horizontal position in accordance with the IPC and Colorado Cross-Connection Control Manual.
- D. Approved Febco backflow preventers include models 825-Y, 825YA, 880, 880V, 860, 765, 850, 805, 870, and 876-V depending on application. Models 805 and 825 are only approved for sizing from ¾" – 2."
- E. Backflow preventers are required at chemical mixing units, which are typically installed in custodial closet chemical cleaning systems.

EXECUTION**TESTS**

- A. The Academy District 20 Project Manager shall be notified when all tests are scheduled and shall have the opportunity to be present for and witness all tests and documentations. Do not begin testing and balancing work until system has been completed and is in full working order.
- B. All hot and cold domestic water lines shall be capped or plugged and tested with 100# hydrostatic test. They shall be proved tight before any piping is covered or concealed in any part of the building construction.
- C. Provide domestic water line testing documentation per CDPHE requirements.

FACILITY NATURAL GAS SYSTEM

GENERAL

REQUIREMENTS

- A. Gas piping and fittings shall be manufactured in the USA.
- B. Gas piping shall be installed in strict accordance with NFPA 54 and International Fuel Gas Code (IFGC), latest edition.

PRODUCTS

PIPING

- A. All underground gas piping outside of buildings should be polyethylene pipe.
- B. Fittings and all joints shall extend not less than 6 inches past end of the fitting onto the pipe section.
- C. All testing of pipe and fittings shall be done prior to wrapping the fittings.
- D. Follow manufacturer's recommendations as to priming, tape widths, etc.
- E. Gas piping should not be routed on roof unless specifically approved by Academy School District 20 Project Manager. If approved, gas piping run across roofs should be mounted firmly to Dura Blok, DBR Series, or other approved equal and placed on ½" - thick rubber pads. Piping shall be designed to accommodate thermal expansions with hard-piped expansion loops. Piping shall be painted with one coat of alkyd primer and two coats of exterior acrylic latex gloss enamel.
- F. Gas piping under floor slabs, inside of building, shall not be used, even if vented sleeves are provided, except, with specific written approval by the Academy School District 20 Project Manager at certain science room locations.
- G. Any tunnels or shafts containing gas piping shall be vented.
- H. Plenum gas routes shall be welded.

FITTINGS

- A. Dielectric fittings shall be installed at the meter if the project contains underground gas piping.
- B. Cathodic protection of the underground piping may be necessary and should be investigated with the specific soil analysis available for the project site.
- C. ASTM-A106 welded fittings should be used on all gas piping 2" and larger.

VALVES

- A. Shutoff valves shall be installed in the main supply to each appliance.
- B. Electrically operated emergency shut off solenoid valves shall be installed in the supply to any room supplied with gas so that the entire gas supply may be stopped to the area.
 - 1. This valve will be controlled by a key operated switch located adjacent to the exit or teacher's workstation.

GAS METERS

- A. The natural gas service will be negotiated by the Academy School District 20 project manager. The architect and engineer should provide necessary data for said negotiations.
- B. The Utility Company shall install these services to and including the meter.

- C. Meter shall be enclosed by a fence. The contractor to provide and install fence and gate.
- D. Provide for digital reading of the meter and pulse count capabilities for integration into DDC system for consumption tracking purposes.
- E. Provide protection bollards at meter sets as required.

PIPING SUPPORTS

- A. All interior gas piping shall be supported by galvanized clevis hangers.
- B. Support spacing shall meet the requirements of the International Fuel Gas Code (Latest Edition).

PAINTING

- A. All exterior gas piping shall be painted with one coat of alkyd primer and two coats of exterior acrylic latex gloss enamel.

EXECUTION

EQUIPMENT AND APPLIANCE CONNECTIONS

At kitchen appliances, where Health Department may require moveable appliances with approved flexible gas connectors, alert architect and Food Service consultant that a means must be provided to temporarily secure these appliances to the wall or floor, by means of latches, brackets, etc.

TESTS

- A. Gas Pipe Testing: Per the requirements of the International Fuel Gas Code (Latest Edition).
- B. The District 20's and architect's representative should be notified prior to testing gas lines so they may be present.

SANITARY WASTE AND VENT PIPING

GENERAL

- A. All waste and vent piping shall be manufactured in the USA.
- B. All waste and vent piping shall be installed in accordance with the International Plumbing Code (Latest Edition).

PRODUCTS

PIPING

- A. Soil pipe and soil-piping and fittings:
 - 1. Bell and spigot or no-hub as approved by current code and District.
 - 2. Coupling clamps shall be Anaco/Husky 4000 Series.
 - 3. Coupling bands shall be 4-band regardless of piping size.
- B. Acid-resistive waste and vent lines may be required for Science lab areas.
- C. When acid neutralizing tanks are specified, they shall be installed in a location that is readily accessible for replacement of neutralizing media.
- D. Waste lines above grade up to and including 4" to be cast iron.
- E. PVC where approved by code and District.
- F. All exposed waste lines from fixtures shall be chrome-plated brass.

- G. Vent piping above ground 3" and over to be cast iron. PVC where approved by current code and District.
- H. Studor type vents are not permissible.
- I. Vent piping above grade up to and including 4" to be same material as waste lines.
- J. Vent piping in return air plenums shall be metal. Vent pipe should project one foot above roof with vandal-proof cast iron vent cap such as Zurn or Smith. Provide increase in size for vent through roof in accordance with code, minimum size 3".
- K. Vent piping penetrating roof areas shall be designed to maintain integrity of the roof assembly.

DRAINS

- A. Design agent to provide a list of rooms requiring floor drains.
- B. Floor drains that are to receive flashing shall be specified with flashing flanges.
- C. Provide floor sinks or drain trenches in boiler room, for draining of mechanical equipment with a minimum of 3" waste line. Slope floor to drain.
- D. Provide floor drains at air compressors for condensate drain line on dryers within 2' of unit.
- E. In rooms with ceramic tile floors, specify square top drains.
- F. Sand and oil interceptors shall be installed in auto shops and parking garages.

TRAPS AND TAILPIECES

- A. Traps may be integral or provided in waste lines.
- B. Provide specialty traps and interceptors in art rooms where applicable.

GREASE INTERCEPTORS

- A. To be installed for all kitchens where required by Code.
- B. Install outside building wherever possible.

CLEANOUTS

- A. Contractor shall install sanitary sewer service, including necessary manholes, on school property.
- B. Cleanouts, line size dual direction, to be provided at 50'-0" on center for interior locations. Minimum cover size, 4".
- C. Provide a floor mounted cleanout in each toilet group at the begin/ end of the line.
- D. Provide a floor mounted cleanout in each art room.
- E. Designs should satisfy local utility regulations.
- F. Ensure that all cleanouts are accessible. Exterior sewer lines cleanouts shall be at maximum 75'-0" intervals, with manhole access at street. At the 5'-0" sewer stub-out from the building, provide line size dual direction cleanout.
- G. Ensure that kitchen floor drains are located near work areas. Coordinate drain locations with kitchen designer.
- H. Provide cleanout upstream and downstream of grease trap if applicable.
- I. Grease traps, if required, shall be placed outside of building structure.

- J. Indoor style traps shall be not utilized unless reviewed and approved by Academy School District 20 Project Manager.

EXECUTION

TESTS

- A. All soil, waste, storm, and vent cast iron sewer piping occurring inside the buildings shall be hydrostatically tested in accordance with the International Plumbing Code (Latest Edition) and all the joints inspected while under pressure.
- B. All soil, waste, storm and vent piping which occurs outside the building area will be tested to a minimum of 10 feet of head pressure. Each joint shall be watertight after 15 minutes.

221400 FACILITY ROOF DRAINAGE

PRODUCTS

DRAINS

- A. Cast iron with gravel stop, weep holes, low dome with a flashing clamp. Utilizing a removable dome strainer and integral gravel stop.
- B. 36"x36" roof flashing for drains minimum.
- C. Roof drain type and flashing shall be coordinated with roofing system being provided or roof assembly compatible with flashing seal. Coordinate roof d size based on designed collection rate.
- D. Roof Flashings - All plumbing pipes passing through the roof shall be flashed around the pipe and over and down inside the pipe at least 1".
 - 1. The base of the flashing shall be a minimum of 24" x 24" on the roof.
 - 2. Roof drain type and flashing shall be coordinated with roofing system being provided.
- E. Roof leaders/downspouts shall not be concealed in exterior chases or ceiling cavities. Exterior routed leaders/downspouts shall be fully accessible.

224000 PLUMBING FIXTURES AND TRIM

GENERAL

- A. All exposed supply and waste piping to fixtures shall be chrome-plated brass.
- B. All fixtures shall have stop valves.
- C. All fixtures shall be provided with vandal-proof aerators.
- D. All fixtures for designated handicap uses must comply with the Americans with Disabilities Act.
- E. Whenever possible, fixtures specified, provided, and installed shall be "in-stock" items at local plumbing supply sources.

PRODUCTS

FIXTURES AND EQUIPMENT

- A. Faucets and Flush valves shall be manufactured by Moen.
- B. The use of concealed style flush valves is prohibited.

- C. The use of sensor style faucets and flush valves is prohibited.
- D. Eye wash and shower stations: ensure that drain is located properly, and that floor system is constructed to provide positive drainage.
- E. Locate drain piping discharge to prevent water from reaching wall and guide toward drain.
- F. Group toilet, shower, locker, and kitchen area drains shall ensure that drain is located properly and that floor system is constructed to provide positive drainage.
- G. Locate drain piping discharge to prevent water from reaching wall and guide toward drain.
- H. Water Closets (wall hung): For all restrooms, install vitreous china siphon jet elongated bowl water closet with chrome cap nuts and solid plastic open-front white seat, American Standard Model #3351 or approved equal. Wall carriers shall be 4-bolt style. Provide Top Spud flush valve with vacuum breaker or approved equal. All flushometers to be manually operated and installed exposed rather than concealed behind walls unless otherwise approved. Comply with ADA requirements for mounting height.
- I. Urinals: Provide vitreous china wall-hung, washdown type urinals with integral strainer, American Standard Model #6590 or approved equivalent. Provide Top Spud flush valve with vacuum breaker or approved equal. All flushometers to be manually operated and installed exposed rather than concealed behind walls unless otherwise approved. Reference appropriate code for installation requirements. Trough urinals shall not be used. Verify and modify mounting height of fixtures as needed to comply with ADA requirements.
- J. Lavatory: Vitreous china except as otherwise noted.
- K. In all facilities, include concealed arm carriers. Provide American Standard Model #0355.012 or approved equal. Provide required fixtures and trim for handicapped access. Electronic faucets in areas as approved by the District.
- L. Wall-hung, with pop-up waste for faculty and administrative areas. Handicapped access should be provided.
- M. Wall-hung, faucets with wrist control handles and open strainers in kitchens and health rooms, 31" floor to rim. Handicapped access should be provided.
- N. Provide screwdriver stops, vandal-proof aerators, cast brass P-traps with cleanout for all lavatories.
- O. All lavatory faucets shall be at 4" centers as manufactured by Moen.
- P. Stainless steel sinks for countertop installation shall be self-rimming type. Specify minimum 18-gauge sinks, fully undercoated with sound deadening material. Factory punching shall be specified to accommodate specified fittings.
- Q. Service Sink: Floor-type preferred in all schools, terrazzo or molded stone floor service sink with rim guard and strainer; exposed double faucet with integral stops, hose and spout, bucket hook, and vacuum breaker. Mount faucet trim 24" above floor. Faucet shall be Chicago, Model # 897-CCP or approved equal.
- R. Commercial Kitchen Sinks: obtain specifications for commercial kitchen sinks and faucets from Academy School District 20 Food Services Department and/or Academy School District 20 Project Manager.

- S. Garbage Disposals: For non-commercial applications, the use of garbage disposals is prohibited. For commercial applications, provide In-Sink-Erator model #SS-75.
- T. Drinking Fountains: Fountain for general usage. Shall be bi-level, wall-hung, with push-bar and bottle filler on lower section, automatic volume regulators, self-closing valves, and cast-brass trap with cleanout; Provide Elkay Model #LZSTLR8WS or approved equal. Set 24" floor to rim in elementary schools; 30" floor to rim in middle and high schools. There shall be no bubblers or drinking facilities in toilet rooms, science rooms, or art rooms. Furnish with screwdriver stops. All drinking fountains shall be handicapped-accessible. Fountains shall be box-type with attention given to proper support and vandal resistance. Reference electrical division for power requirements if needed.
- U. Bubblers shall not be allowed in art or science room sinks.

OPERATION AND MAINTENANCE MANUALS

- A. Provide Operation and Maintenance Manuals. Include one copy each of approved Shop Drawings, wiring diagrams, piping diagrams, spare parts lists, as-built drawings and manufacturer's instructions.
- B. Submit operation and maintenance manuals for mechanical Equipment with moving or movable parts, including plumbing systems, per IECC. Instructions for each piece of equipment shall be indicated by a separate tab.
- C. Include typewritten instructions, describing equipment, starting/operating procedures, emergency operating instructions, seasonal changeover, freeze protection, precautions and recommended maintenance procedures.
- D. Include name, address, and telephone number of supplier manufacturer Representative and service agency for all major equipment items.
- E. Bind above items in a three-ring binder with name of project on the cover. Also provide electronic copy of manual in PDF format.
- F. Prepare and provide record documents in accordance with the following:
 - 1. Utilities below floors, slabs and grade: During construction, maintain accurate records of all final locations and inverts for all services inside and outside of the buildings, beneath grade and below floors.
 - 2. Take dimensions from a given fixed benchmark, such as the corner of a building, and neatly and clearly indicate same on reproducible prints.
- A. Provide Record Drawings for all Contract Work.
- B. Incorporate all field changes, change orders and other modifications into the final Record Drawings.
- C. Provide record documents electronically on a disk to District 20, PDF and AutoCAD formats. Also provide one set of prints to District 20.

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Division 23 – Heating, Ventilating, and Air Conditioning

COMMON WORK REQUIREMENTS FOR HVAC

GENERAL

- A. The purpose of this section is to provide general design guidelines and considerations for HVAC systems. architects, engineers, and/or contractors shall be responsible for design and installation of mechanical systems that meet all applicable codes and that meet or exceed the guideline specifications outlined herein.
- B. Equipment shall conform to State and/or local energy conservation standards.
- C. It is the intent of Final Construction Documents and Specifications to result in a complete mechanical installation in complete accordance with all applicable local codes and ordinances.
- D. Drawings are diagrammatic in character and do not necessarily indicate every required pipe, offset, transition, etc. Items not specifically mentioned in the Specification or noted on the drawings, but which are necessary to make a complete working installation, shall be included.

PRODUCTS

GENERAL REQUIREMENTS

- A. Academy District 20 Facilities Management performs ongoing service and maintenance on all mechanical equipment and has pre-approved the following equipment manufactures for HVAC system components:
 - 1. Furnaces: Trane, Carrier, Lennox, Daikin or Approved Equal.
 - 2. Unit Heaters: Sterling, Modine, Reznor, or Approved Equal.
 - 3. Cabinet unit Heaters: Trane, McQuay, Envirotech, Sterling or Approved Equal.
 - 4. Packaged Units (RTU's): AAON United Metal Products or Approved Equal.
 - 5. Multizone Units: Seasons Four, Temtrol, United Metal Products or Approved Equal.
 - 6. Central Station Units: AAON, Temtrol, Annex Air, United Metal Products or Approved Equal.
 - 7. Exhaust Fans: Greenheck, Cook, Penn-Barry or Approved Equal.
 - 8. Split-Systems: Mitsubishi, Daikin or Approved Equal.
 - 9. Chillers: Daikin/ McQuay, Carrier, Tandem, AAON or Approved Equal.
 - 10. Condensing Units: Daikin/ McQuay, Carrier, AAON or Approved Equal.
 - 11. Pumps: Grundfos, Armstrong, Paco, Bell & Gossett or Approved Equal.
 - 12. Unit Ventilators: Trane, McQuay, Change-Aire, Nesbitt-Aire or Approved Equal.
 - 13. VAV's: Nailor, Price, Envirotech or Approved Equal.
 - 14. Air Curtains: Mars or Approved Equal.
 - 15. Fintube radiation – Sterling, Vulcan or Approved Equal.
 - 16. Radiation Panels – Runtal.

B. System Types:

1. Mechanical or indirect evaporative cooling may be used on designated projects. Kitchens may utilize direct evaporative units.
2. Air- side or water-side economizers shall be required for all systems.
3. All dampers shall be electronically operated. The use of barometrically operated dampers is prohibited.
4. All systems should provide positive ventilation. Ventilation shall be provided to comply with the requirements of ASHRAE Standard 62 and International Mechanical Code, latest edition. Air flow and sizing of HVAC equipment and duct work shall be based on quantities required for ventilation not just for heating and/ or cooling.
5. Heat source should be a central hot water system. Direct fired heat exchangers should not be used without the permission of the District. For new construction, the District prefers “Condensing” boiler plants. Such plants operate most efficiently with high delta-T return temperatures to the boiler loop. Designers should be careful to appropriately size coils to extract the maximum heat per the boiler manufacturer’s recommendations. Domestic water pre-heat and other considerations should be made to utilize return water heat.
 - a. Boilers: Lochinvar.
 - b. Boiler Pumps: Grundfos Magna 3.
6. Basic heating, cooling, and ventilating equipment shall be of the central station unitary type.
7. Air systems utilizing hot water heating coils with a mixed air temperature less than 40 degrees Fahrenheit shall have coil pumps.
8. Supplemental heating may be unit heaters, cabinet heaters, radiation, etc.
 - a. Entries/ Vestibules/Stairwells: Minimum of 50 Btuh/ Ft2 – Fan Powered.
 - b. Shipping & Receiving: Minimum of 50 Btuh/ Ft2 – Fan Powered.
 - c. Mechanical/ Boiler/ Storage Rooms: Minimum of 40 Btuh/ Ft2 – Fan Powered or Radiation.
9. Electric heat shall not be used, unless by approval of District.
10. When air conditioning is required, consider using Geo Exchange, VRF, or indirect evaporative pre-cooling and ice storage. Air-cooled chillers are preferred over water-cooled chillers. Chilled water is preferred over DX. Identified sub-loads for seasonal employees (summer) may consider DX for offices and similar small areas. The higher of IECC or Energy-Star rated equipment is preferred.
11. Provide 3-way control valves at the furthest heating and cooling equipment for each piping branch.
12. The District encourages innovation and investigation and will consider alternative sustainable technologies.

13. Mechanical designs should be coordinated with the District Facilities Management Department. Design team and contractors shall collaborate with District Facilities Management and Energy Specialist as required to determine and specify mechanical systems which shall have the lowest life cycle cost.
14. The District requires rated premium-efficiency or ECM motors, coupled with VFD's to match motors with actual loads.
 - a. VFD's – ABB ACH Series, Newest Version.
 - b. Provide direct drive style equipment when it's a viable option.

C. Controls:

1. The District has an established District-wide Building Automation System (BAS) installed by:
 - a. Johnson Controls.
 - b. Siemens.
 - c. Delta Controls.
2. Design consultants shall consult District prior to specifying BAS manufacturer for new construction, renovations and additions.
 - a. Renovations – Extend existing system.
 - b. Additions – Extend existing system.
 - c. New Construction – Johnson Controls or Delta by ATS Rocky Mountain.
3. Contractor Qualifications: The Controls contractor shall be factory-authorized by the respective manufacturer to provide pertinent installation and service.
4. All new buildings, additions, upgrades, replacements, and other renovations shall be designed for integration into the District BAS system.
5. The installed system shall be “BACnet” standard.
6. Separate software, gateway devices, drivers or routers are not acceptable. Mixing of controls systems is prohibited.
7. The temperature control system shall be an extension of the existing BAS system with seamless integration including graphics and required software and controller upgrades.
8. Air-side equipment controls shall be field installed. Factory provided controls is prohibited. Exception shall be given for Dx cooling and gas-fired heating, which shall utilize on-board factory controls, but shall be enabled and disabled by the building's DDC.
9. All VFD's shall be integrated into the District's BAS system.
10. Provide laminated control diagrams in each control panel for each piece of major controlled equipment or system.
11. Backup disk(s)/ thumb-drives, shall be left on-site that will allow the District 20 to fully download the entire BAS System software, including programming point database, configuration, graphic screens and all library of typically composed objects, and details supporting navigation, screens and graphics.

12. A Programmers Manual shall be provided with graphic and text descriptions of all functions required for software modifications and developments. The use and installation of high-level programming language shall be included in this manual. The manual shall include ASCII text (or block diagram printouts for graphical programming language-based systems) of all BAS programs with the spreadsheet inventorying the name and location of each program. Each file shall be accompanied by a “plain English” description of the program operation by subroutine to assure that future programmers can easily modify the existing database. The manual shall contain computerized printouts of all data file construction including all point information, physical terminal relationships, scales and offsets, alarm limits, messages, schedules, etc.
13. All set-points and parameters shall be adjustable.
14. Adjustable room temperature set-points are as follows:
 - a. Occupied:
 - i. Heating: 68 degrees Fahrenheit.
 - ii. Cooling: 74 degrees Fahrenheit.
 - b. Unoccupied:
 - i. Heating: 55 degrees Fahrenheit.
 - ii. Cooling: 85 degrees Fahrenheit.
15. The system shall be placed into operation and adjusted under operating conditions, being carefully coordinated with other related Subcontractors. See section on "Testing, Adjusting and Balancing."
16. Controls conduits shall be blue and a minimum of ¾". Wire counts shall not exceed conduit capacity as outlined by the NEC.
17. Free aired, plenum rated cable, shall be supported by the means of j-hooks, ring hooks, cable tray, etc. Cabling not properly supported or resting on the ceiling grid is prohibited and will be corrected at the contractor's expense.
18. All current sensors shall be split-core style.
19. Control voltage shall not exceed 24 volts.
20. Control valves shall be fully modulating characterized type with stainless steel ball and stem.
21. Control dampers shall be fully modulating linear type.
22. Provide BTU metering for heating and chilled water systems:
 - a. Metering shall be by means of electromagnetic (pass through style) or ultrasonic flow meters with matched temperature sensors.
 - b. BTU metering shall have dedicated readout display unit that is integrated into the District's BAS system.
 - c. Acceptable manufacturers: Onicon or Badger.
23. Provide air flow stations for all central station air handling equipment:
 - a. Air flow stations shall be thermal dispersion type.
 - b. Use of pitot-tube and fan array measuring device is prohibited.

- c. Flow stations shall have dedicated readout display units that are integrated into the District's BAS system.
 - d. Design equipment shall be Ebtron Gold Series.
 - 24. The use of floating-point logic and equipment is prohibited.
 - 25. The architect or mechanical consultant shall deliver a copy of the Temperature Control submittal, including drawings of system layout, connections to central School District system, and detailed sequence of operations, to District Facilities Management Department for review and written approval prior to release of approved submittal.
 - 26. Pneumatic systems are not permitted for new installations but may be considered for renovation projects subject to review and acceptance by District Facilities Management Department. All controls shall be electronic.
 - 27. Controls Floor plans (at least one for each floor) – Shows the approximate location of the control panels, thermostats, equipment, network wiring, thermostat wiring and any specific controls required for the job. All this information is overlaid on top of the mechanical floor plan showing the architectural layout (Wall and room #'s).
- D. Chemical Water Treatment:
- 1. Provide chemical water treatment for:
 - a. Hot water heating systems.
 - b. Chilled water systems.
 - c. Condenser water systems (cooling towers).
 - 2. Academy District 20 Facilities Management performs chemical treatment maintenance. Contact District 20's chemical provider for specification requirements.
 - 3. Glycol:
 - a. The use of glycol shall be approved by District Facilities Management.
 - b. Minimum Concentration: 25%.
 - c. Use inhibited propylene glycol only.
 - i. G2 Solutions: Arctik Snow.

EXECUTION

- A. Access:
- 1. Provide access to all valves and equipment, including filters.
 - 2. Provide access doors in ducts on both upstream and downstream sides of heating coils to allow for cleaning of coils.
 - 3. Arrange piping and ductwork to not block required access to equipment for servicing and maintenance.
 - 4. Whenever possible, locate serviceable equipment (terminal heating, VAV, etc.) in corridors and areas where maintenance activities do not affect classroom or office functions.
 - 5. All filters shall have side access; bottom access is prohibited.

B. Remote Metering:

1. Make provision for communication from the gas, water and electrical service meters to remote readers.
2. Coordinate with utility company and Academy School District 20 Project Manager for requirements.
3. Provide for meter to be read through building automation system (BAS).

C. Mechanical Design Criteria:

1. Functions and educational requirements as pertaining to mechanical systems are described under item B: General Design Considerations.
2. The design engineer shall review these sections carefully to establish the intent and scope of educational function for each area.
3. Mechanical Design and Installations shall comply with the most recent published and locally adopted requirements of the following:
 - a. International Energy Conservation Code.
 - b. International Plumbing Code.
 - c. International Mechanical Code.
 - d. Colorado Department of Labor and Employment regulations.
 - e. International Energy Code.
 - f. International Building Code.
 - g. Colorado State Boiler Code.
 - h. Colorado Department of Health Regulations.
 - i. NFPA 5000 Standards.
 - j. International Fire Code.
 - k. International Fuel & Gas Code.
 - l. City of Colorado Springs Fire Department.
 - m. State & regional codes or standards that supersede international codes as applicable, including fire, utility regulations, etc.

D. General Design Considerations:

1. Adequate space must be given to accessibility and servicing of equipment, including filter changing, equipment replacement, and major repairs. All equipment must be installed so that it can be serviced and repaired as recommended by the manufacturer (e.g., access panels must open completely, filters must be replaceable without bending, etc.) and per appropriate code.
2. The District encourages Schematic Design consideration of resource efficient alternates – GSHP, VRF, ERV, Condensing Boilers, Chillers, Cooling towers, ice storage, VAV, High efficiency motors, VFD, high SEER equipment (Energy Star standards), etc.
3. Coordinate with the District Facilities Management and Energy Specialist in developing designs.

4. Specify equipment that has low routine maintenance, e.g., exterior grease fittings, etc.
5. All 3-phase motors 1 HP or larger shall have phase protection.
6. All 10-HP and larger motors shall include integral capacitors, high power factor, or other technology to maintain high load factors for soft-start and energy conservation purposes.
 - a. Utilize direct drive equipment when possible.
7. Unit ventilators, unit heaters and cabinet unit heaters shall have direct drive motors, ECM style. Consider location of units with respect to air distribution, noise, and service access.
8. Consideration must be given to equipment noise and vibration isolation, especially when equipment is mounted above grade. Consideration must also be given to locating equipment away from quiet areas and classrooms.
9. Provide sufficient isolation zone valves for the hydronic heating/cooling system to be serviced without disabling other parts of the system. This shall include each piece of equipment, such as pumps, unit heaters, radiation units, coils, heat exchangers, etc. Valves and valve locations should be identified in plan schematics rather than just referred to in specifications.
10. No system shall have control voltage exceeding 120 volts (24 volt preferred).
11. Indirect evaporative coolers used with air handling units shall have access doors for pad removal as large as the pads which are to be serviced. Water tank, pad rack, or any area downstream from pads shall be of a rust-resistant metal such as galvanized, stainless, etc. Consideration should be given to electrostatic type powder coatings. Indirect evaporative cooler systems must be specified with water treatment and treatment monitoring systems to prevent water and air quality problems.
12. Vibration Isolation
 - a. Provide vibration isolation for motor driven equipment, connecting piping, and/or ductwork in accordance with manufacturer's recommendations and ASHRAE guidelines.
 - b. The design engineer shall also work closely with the structural engineer to determine the level of vibration isolation that may be required for each piece of mechanical equipment.
 - c. Whenever possible, locate air handling equipment over hallways, restrooms, storage areas and other similar areas to minimize vibration in occupied areas.
 - d. Mechanical equipment that creates vibrations should not be located above or directly adjacent to any auditorium or performance space.
13. Zoning: Heating and A/C systems shall be zoned according to direction and severity of exposure and occupancy and use of space. In addition, the following areas shall have individual air handling control:
 - a. Individual classrooms (VAV, CO2/ DCV).
 - b. Office and combined office (VAV/ DX).
 - c. Conference areas (VAV, CO2/ DCV/ DX).

- d. Media Center (VAV, CO2/ DCV).
- e. Entries (CUH/ Air Curtain/ Radiant).
- f. Cafeteria (VAV, CO2/ DCV).
- g. Auditorium (VAV, CO2/ DCV).
- h. Gymnasium (VAV, CO2/ DCV).
- i. P.E. Locker Rooms (MAU).
- j. Large Music areas (VAV, CO2/ DCV).
- k. IT closets (Split System).
- l. Computer Labs (VAV, CO2/ DCV, DX).
- m. Large electrical rooms (Exhaust Fan with Transfer).
- n. Other areas subject to special uses and occupancy.

TESTING, ADJUSTING AND BALANCING OF MECHANICAL SYSTEMS

A. District Approved TAB contractors:

- 1. Midwest Balancing.
- 2. Precision Test and Balance.
- 3. Elite Balancing.
- 4. Jedi Balancing.
- 5. Griffith Engineering.

MECHANICAL SYSTEMS INSULATION

GENERAL

- A. Insulation shall be standard brands with proper flame-spread ratings, having no asbestos content.
- B. Flame spread rating shall not exceed 25 and smoke developed rating shall not exceed 50.
- C. Insulation shall meet the requirements of NFPA 90 for fire resistance.
- D. Choose insulation type and thickness based on the International Energy Conservation Code to maintain operating economy; to prevent heat gain or loss into unoccupied areas; to prevent condensation damage; and to prevent freezing.
- E. Provide vapor barrier on insulation of cold pipes and ducts. Insulation will typically be required as follows:
 - 1. Handicap accessible fixtures per code.
 - 2. Provide jacket, shell on, or apron around exposed insulation.

PRODUCTS

DUCTWORK INSULATION

- A. External duct insulation is preferred to duct lining when possible.
- B. Do not call for any internal duct lining of supply ducts for direct evaporative cooling.

- C. For acoustical isolation and sound attenuation, attenuators specifically designed for the application shall be approved by the District's Facility Management Department.
- D. Design and installation consideration shall be given to occupancy areas with special acoustical needs including but not limited to band and music rooms, conference rooms, auditoriums, lecture halls, executive offices, air transfer from cafeteria to kitchen, etc. Provide appropriate sound attenuation for these areas. It is required.
- E. Avoid locating mechanical equipment directly above or adjacent to designated quiet areas.
- F. Exposed ductwork shall be wrapped with insulation board.

PIPING INSULATION

- A. Insulation thicknesses shall meet the requirements of the International Mechanical Code and International Energy Conservation Code (Latest Edition).
- B. Insulation and all materials on the interior and exterior surfaces of ducts, pipes, and equipment shall have a composite fire and smoke hazard rating not exceeding: Flame spread - 25; fuel contribution - 50; smoke developed - 50, as determined in accordance with ASTM Standard E-84. All insulation materials used for valves and fittings shall have the same ratings as the pipe insulation. Information must be submitted by means of manufacturer's literature showing that the proposed materials conform to above specification without exception.
- C. Fiberglass pipe insulation shall be rigid molded and non-combustible with 'K' factor of 0.23 at 75°F. Jacket shall be all service (ASJ) vapor barrier jacket with white kraft paper reinforced with glass fiber yarn and bonded to aluminum foil, secured with self-sealing longitudinal laps and butt strips. Johns Manville 'Micro-Lok' or equivalent.
- D. Hydros Calcium Silicate insulation shall be rigid molded, non-combustible per ASTM E 136, conforming to ASTM 533, asbestos-free with 'K' factor of 0.40 at 300°F., maximum service temperature 1200°F., compression strength (block) minimum of 200 PSI to produce 5% compression at 1-1/2" thickness. Johns Manville 'Thermo-12 Gold' or equivalent.
- E. Fiberglass rigid board insulation for equipment shall conform to ASTM C612 with 'K' factor of 0.23 at 75°F, R=8.0 minimum, 3.0 pound per cubic foot density. Provide vapor barrier jacket (FSK) with aluminum foil reinforced with fiberglass yarn and laminated to fire-resistant kraft, secured with UL listed pressure sensitive tape and outward clinched expanded staples and vapor barrier mastic. Johns Manville 'Spin-Glas' or equivalent.
- F. Elastomeric foam insulation for piping and equipment shall be flexible, cellular, molded or sheet, conforming to ASTM C534, with 'K' factor of 0.28 at 75°F., maximum service temperature of 220°F., maximum flame spread rating of 25 and maximum smoke development rating of 50 (3/4" thickness and less). Connections shall be made using manufacturer's approved waterproof vapor barrier retarder adhesive. Provide outdoor U.V. protective coating on all insulation exposed to ambient conditions, including one layer of alumiclad piping protection wrap.

METAL JACKETING

- A. Metal jacket shall be 0.016-inch smooth embossed aluminum. Provide moisture barrier lining for service temperatures 60°F and less except where applied over insulation with All Service Jacket (ASJ) vapor barrier jacket. Aluminum jacketing shall be installed where specified herein or otherwise indicated on the Contract Documents and Specifications.

- B. Provide where piping is exposed in occupied areas 9'-0" AFF and below.
- C. Provide aluminum jacketing for all exterior piping insulation.

PVC JACKETING

- A. PVC jacketing shall be Zeston 2000 or equivalent, gloss white, 0.030-inch thickness, minimum, and shall have a composite fire and smoke hazard rating not exceeding; flame spread -25; smoke development -50. Connection shall be made using tacks and pressure sensitive color matching vinyl tape. Seams shall be on the bottom side of pipe and fittings.

EXECUTION

- A. Mechanical Identification: all heating and cooling supply and return, gas piping, where exposed to view and above accessible ceilings shall be identified by the following acronyms:

Heat Pump Water Supply	HPWS
Heat Pump Water Return	HPWR
Pumped Condensate	PC
Cold Water (domestic)	CW
Heating Water Supply	HWS
Heating Water Return	HWR
Chilled Water Supply	CWS
Chilled Water Return	CWR
Condenser Water Supply	C
Condenser Water Return	CR
Refrigerant	R
Vent	V
Overflow	OF
Drain	D
Glycol Supply	GS
Glycol Return	GR
Natural Gas	NG

- B. Provide acrylic plastic wrap-around type markers with directional flow arrows, UV resistance and legend printed four (4) times for 360-degree visibility. Provide Seton Setmark or approved equal.
- C. Provide Metallic Detection Tape for all underground storm and sanitary sewers, natural gas lines and water piping. Provide 2" wide tape, 0.035". Make: Seton style 37000 series 2-inch tape for burial 4 inches to 6 inches below surface, style 37000 series 6-inch tape for burial deeper than 6 inches.
- D. Directional flow arrows shall be included on the pipe or insulation at 15'-0" intervals.
- E. All color coding shall be in accordance with the latest issue of the ASME (ANSI) standard A13.1 recommendations, based on the "contents" of the piping.
- F. Provide valve tags for all valves provided on project. Provide a valve tag chart for all valves provided on the project.
 - 1. Standard brass valve tags, 2" diameter with 1/2" high numerals.
 - 2. Identify all plumbing services with 1/4" letters above the valve number ("PLBG").

3. Attach to valves using brass “jack” chain and brass “S” hook.
- G. Provide valve chart for all valves provided as a part of this project. Frame and place under clear glass. Hang in Mechanical Room or in location as directed by the District 20.
- H. Provide engraved vinyl plates for each major piece of plumbing equipment provided.
 1. Nameplates: 3/4" x 2-1/2", Seton Cat. #2060-20 or approved equal.
 2. Scratch-resistant, non-static, high pressure laminate with contrasting inner core color.
 3. Finish and Color: As selected from manufacturer’s standard colors and finishes, unless otherwise indicated.
 4. Exposed Engraved Inner Core: White, unless otherwise indicated.
 - a. Thickness: 1/8 inch, unless otherwise indicated.
 - b. Engraved Process: Machine engraved letters, numbers, symbols, and other graphic devices to produce precisely formed copy indented to a uniform depth with sharply formed edges. Engrave copy through the exposed face ply to expose the core ply.

HEATING HOT WATER SYSTEM AND EQUIPMENT

GENERAL

- A. All equipment—pumps, coils, sections of radiation, etc.—shall be provided with shut-off valves.
- B. Provide auto flow valves for system balancing and balancing valves in fixed-flow systems.
- C. Provide flow meter and Btu meter with matched sensors for flow measurement in main lines and distribution zones of building with BacNet interface.
- D. Provide thermal storage/buffer tank for smaller systems to prevent short cycling.

PRODUCTS

PIPING

- A. Hydronic Piping.
 1. All piping and fittings shall be manufactured in the USA.
 2. Black steel with cast iron screwed fittings for 2" and under, black steel with welded fittings above 2". Weld-O-Lets and Thread-O-Lets may be used for take offs, mitered tees not allowed.
 3. Type "K" copper with 95/5 solder joints may be used between sections of fin tube and may be allowed as a contractor's option for piping less than 2". Do not use dielectric unions in closed loop hydronic heating or cooling systems. Dielectric waterways/ nipples are preferred. If they are absolutely unavoidable, provide valve on each side of union and provide high temperature gaskets.
 4. Aquatherm piping is a viable option for new construction. Review with Academy School District 20 Project Manager prior to specifying for project design specifications.
 5. Piping shall not be installed under slabs unless in an accessible trench.

6. Piping shall not be installed in exterior walls.
7. Piping above ceilings shall be on the room side of the building insulation and shall not be installed adjacent to exterior walls or in soffit without special precautions against freezing.
8. Chilled water and heating hot water piping shall be supported independently of each other.
9. Radiant slabs shall be reviewed prior to designing and shall not be used in structural floors.
10. Provide drains, isolation valves, air vents, etc., as required for maintenance of system.
11. Use manual air vents unless automatic vents are absolutely necessary.
12. Automatic air vents shall be provided at the highest point of the system.
13. All piping components shall be stored in protected areas where dirt and debris are prevented from contaminating the pipes. Keep coils wrapped and sealed until installed in place to prevent contamination.
14. The use of “Victaulic” fittings is prohibited.

GAUGES

- A. Refer to Division 22 for Pressure and Temperature Gauge requirements.

PIPING HANGERS AND SUPPORTS

- A. Refer to Division 22 for Pressure and Temperature Gauge requirements.

VALVES

- A. Valves shall be provided for main heating lines from Boiler Room into quadrants, or some reasonable division, to permit partial draining of boiler or loop, for repairs, without the necessity for replacing all the boiler water treatment and/or glycol. Allow for piping expansion and contraction without stressing pipe, joints, or connected equipment. Mechanical expansion compensation devices shall not be used without District approval. Use bottom take-offs for branch piping wherever possible to avoid trapping air. Maximum velocity 5 feet per second in branch piping.
- B. The use of butterfly and gate valves is prohibited.
- C. Isolation valves shall be ball valves with stainless steel ball and stem.
- D. Provide balance valves at all heating/cooling equipment and as detailed on the Contract Documents:
 1. Armstrong: CBV Series
 2. Tour & Andersson: TA Series
 3. Griswold: Isolator Y, Isolator R, Uni-Flange
- E. Zone control valves shall be Belimo or Approved Equal.
 1. Coordinate with existing BAS system in facility.
 2. Control valves shall be ball valves with stainless steel ball and stem. Equal percentage characteristics for throttling service, linear characteristics for 3-way mixing or diverting service, with a range of 30 to 1, and maximum full flow pressure drop of 3 psig based on the system fluid.

3. Two-position valves shall be line size. Closeoff: Water – 150% of total system (pump) head.

HOT WATER GENERATING EQUIPMENT

A. Boiler Plants:

1. Boiler rooms should be on the ground floor with direct access to outdoor vehicle traffic areas for equipment access and maintenance.
2. Doors to boiler rooms shall be wide enough to allow for replacement of equipment without dis-assembly or demolition.
3. Space above boiler room shall not be used for human occupancy.
4. If boilers are to be mounted on structural floors special consideration must be given to the weight of the boilers and structural support and access path to the outdoors for servicing and replacement of boilers in the future.
5. Boilers shall be installed on concrete pads.
6. Controls should be provided for automatic shutdown of boiler when outside air temperature warrants and should be integrated into the BAS control system.
7. Allow space in the boiler room for make-up water chemical treatment. Top of chemical pot feeder shall not be more than 36" A.F.F. Include bypass chemical feeder and reduced pressure backflow prevention in contract.
8. Backflow preventers shall be no more than 5 feet above floor level. Specify initial testing and certification of backflow preventers to be included in contract. A resilient seat spring-loaded check valve shall be installed directly ahead of backflow preventer. Pressure reducing valves for makeup systems to be located downstream of backflow preventers. Glycol feeders shall be included for monitoring on the BAS.

B. Boiler types:

1. Condensing Boilers are required for new construction projects.
 - a. Approved boilers include:
 - i. Lochinvar.
2. Replacement boilers shall be condensing style boilers.
3. Induced draft fans shall not be used unless otherwise approved by the District's Facilities Management Department.
4. All boilers shall meet ASME Code requirements and shall have AGA approval where applicable. All installations shall comply with the State Boiler Code.
5. Boiler Startup. Boiler startup shall be by Manufacturer's Representative, and shall be scheduled with, coordinated with and witnessed by the District 20.
6. Glycol testing levels, chemical tests, and boiler startup reports shall be presented to the Academy School District 20 Project Manager as a part of the O&M documentation.

C. Boiler Controls:

1. All boilers shall have high temperature (or pressure) and low water cutoffs with DDC and local alarm indicating lights and manual reset.

2. All boilers shall provide a BAS interface for temperature reset and other functions related to boiler operation.
3. Boiler trim for water boilers shall include manual reset low water cutoff, manual reset high temperature limit, pressure gauge, thermometer, separate operating aqua stat, pre-wired control panel, and ASME relief valves.
4. Provide operating instructions on control panel.
5. Fuel: Natural gas.
6. Combustion air shall be provided as required by the IMC. Combustion air openings shall be provided with automatic dampers that open when boiler fires. A boiler circuit proving switch shall be wired in, to prove damper is open before allowing boiler to fire, per IMC. Mechanical or plumbing equipment that could freeze shall not be located near the outside air intakes.
7. If a large quantity of combustion air is required, a dedicated make-up air unit shall be provided with heating capability to provide 65-degree air.
8. Provide boiler room ventilation for temperature control. Do not use exhaust fans, supply fans may be used. Avoid freeze conditions including location of piping near ventilation openings.
9. Boilers shall be rated for altitude of facility where they will be installed. Typically, multiple boilers shall be provided. Consult with District's Facility Management Department to determine whether multiple boilers shall be required.
10. Size total boiler plant gross capacity at 100% of heating load at minus 5 F. plus 20% pickup factor. Provide load calculations on mechanical equipment schedules. Multiple boilers are required for redundancy. Suggested loads are 67%, for each boiler.
11. Provide boilers rated for up to 50 lb. working pressure.
12. Provide thermometer on return piping directly before boiler.
13. Provide thermometer on supply piping directly in boiler loop and common building supply.

PUMPS

- A. Use lead-standby parallel pumping on all main pump circuits. Provide standby pump with one automatic change over. Provide DDC alarm on standby pumps.
- B. Pumps shall be Energy-Star rated high efficiency pumps.
- C. Approved Manufacturer's include:
 1. Grundfos.
 2. Armstrong.
 3. Bell & Gossett.
 4. Paco.
 5. Approved Equal.
- D. Provide strainers and check valves in pump discharge.
- E. Mechanical seal pumps will be normally used. Armstrong/ Paco is preferred.

- F. Inline circulators shall be wet rotor type. Grundfos is preferred.
- G. Call for gauges at intake and discharge of each pump, with isolation valves.
- H. Utilize primary/secondary pumping where appropriate for flexibility and efficiency of operation.
- I. Provide two heating water pumps each at 100% with automatic lead/lag sequencing.
- J. Prefer variable-speed pumps for energy use optimization. ABB ACH 550/580 Series VFD's with bypass and BACnet Card are preferred.

EXPANSION TANK

- A. Use ASME rated expansion tanks with diaphragm rated for glycol service when applicable.
 - 1. Use ASME rated relief and safety valves, to be sized to Insurance Company requirements.
 - 2. Provide adequate space for accessibility to tanks and for tank replacement.
 - 3. Pre-charged expansion tanks shall be set to final pressure in field by contractor based on design engineers' calculations. Final pressure shall be written on expansion tank and recorded in the final TAB report.
 - 4. Tank shall be equipped with bladder integrity monitor and air-side pressure gauge. These devices shall be monitored by the building's DDC system.

CHILLED WATER SYSTEM AND EQUIPMENT

GENERAL

REQUIREMENTS

- A. Mechanical Cooling:
 - 1. Mechanical cooling shall be provided for all new construction projects and shall be provided as requested for renovation, addition, or upgrade projects. The general system shall be similar to requirements of Heating and Ventilating systems.
 - 2. Systems shall be designed so that no refrigeration is required when outside temperature is below 55 degrees.
 - 3. Systems shall not be capable of simultaneous heating and cooling per the IECC. Heating-cooling changeover shall be automatic.
 - 4. Routine maintenance is a primary factor in system choice up to 50 tons, e.g., air cooled condensers. Operating costs are a primary factor in system choice over 100 tons, e.g., water cooled central chillers. Design consultants should perform a comparative costs and benefits analysis of this and discuss with Academy School District 20 Project Manager before selecting system. On water cooled systems consider indoor sump for cooling tower freeze protection. On water systems, consider flat plate heat exchangers.
 - 5. Computer labs shall be mechanically cooled. Separate or split cooling systems are preferred for computer spaces.
 - 6. Administrative offices and media center areas shall be mechanically cooled and shall have separate air handling systems.
 - 7. Cooling towers are preferred to provide "free cooling" when chillers are in use.

8. Sub-meter water supply to cooling towers via BAS for separation from wastewater charges.
9. Provide flow meter and Btu meter with matched sensors for flow measurement in main lines and distribution zones of building BacNet interface.
10. Provide thermal storage/buffer tank for smaller to prevent short cycling of cooling equipment.

AIR TEMPERING SYSTEM AND EQUIPMENT

GENERAL

A. Ventilation

1. All occupied spaces within the building shall be provided with exhaust fan whenever any space requires exhaust air only, the make-up air should be provided from other areas of the building. Provide access for maintenance and replacement of all ventilation equipment.
2. The air systems, supply, return, and exhaust shall be designed and balanced so that the building will have a slight positive pressure at all times.
3. Ventilation requirements should conform to the approved IMC, ASHRAE Standard 62, and Colorado Revised Statutes. Those requirements will be considered as minimum. Consideration should be given in special areas to increasing ventilation requirements, e.g.: science rooms, computer labs, art rooms, copy centers, welding shops, locker rooms.
4. Provide airflow stations on VAV systems. Ebtron Gold Series preferred with BACnet interface and temperature output capabilities.
5. The fresh-air requirement may be reduced to minimum code requirements when operating on the mechanical cooling cycle.
6. Carbon dioxide sensors are preferred to monitor for fresh air, maintaining an indoor carbon dioxide level no greater than 700 ppm greater than outdoor air for gymnasiums, cafeterias, and auditoriums.
7. Use prudent design precautions to prevent placing outside air intakes in areas that will not provide fresh outside air, e.g., bus loading areas, kitchen exhaust, etc.
8. Kitchen shall be exhausted by a kitchen hood.
 - a. The kitchen ventilation system must comply with the requirements of IMC, IFC, NFPA, and Local AHJ.
 - b. Direct-fire hoods are not permitted in kitchen areas.
 - c. Make-up air shall be supplied directly into the space by means of a dedicated gas fired unit with cooling capability.
9. Air exhausted from toilet rooms, kitchens, and teachers work areas, rest rooms, copy rooms, shower rooms, locker rooms, and science laboratories shall not be recirculated at any time to other areas.
10. All fans shall be mounted with vibration isolation. Flexible connectors shall be included between all fans and connecting ductwork, if required.

11. In areas where noise must be kept at a minimum, such as classrooms, offices, and most other occupied areas, exhaust fans shall be sound attenuated. Sound is a consideration in selection of dampers.
12. Provide dust collecting systems for shops in school buildings. Verify requirements with District 20. Recirculating systems are preferred.
13. All heating and ventilating equipment requiring filters shall be furnished with throw-away 2" pleated type. The contractor shall provide and install temporary filters as needed for testing and operation of equipment during construction. Upon project completion, contractor shall provide and install new filters in all equipment and shall further provide one additional complete set of replacement filters for District 20's use upon completion of project.
14. Exhaust hoods for kitchen and shop areas shall have air volumes (CFM determined by the capture velocities) as recommended by ASHRAE.
15. Roof mounted exhaust fans shall be mounted on 18" minimum tall roof curbs.
 - a. Fans shall be direct drive style with ECM motors and built-in potentiometers.
 - b. Provide units with hinged bases, NEMA 3R disconnect switches, bird-screens and electronic operated dampers.
16. Copy rooms should have separate exhaust zones.
17. Provide slightly negative ventilation system for automotive shops, as compared with adjacent areas. Engine exhaust system should be considered.
18. Provide slightly negative ventilation for finishing room of wood, metallurgy and plastic shops as compared with adjacent areas.
19. Provide filters as required for shop equipment.
20. Investigate requirements for special exhaust systems.
21. Provide for natural cooling and ventilation of kitchen dry storage room. Normal heat requirements of these rooms are low. Do not locate heat sources such as refrigeration compressors in these rooms.

B. Air Devices

1. Preferred manufactures: Price, Titus, Krueger, Tuttle & Bailey or Approved Equal.
2. Provide performance data for each device submitted. Based on volumes indicated on the Contract Documents, data submitted shall include: room schedule, size, connection size, throw, direction of throw, NC/dB level, accessories, finish, material type, mounting type, and color chart.
3. Noise level ratings for registers and diffusers shall not exceed 30 db, "A" scale, measured at occupant level.
4. Grilles and registers shall not have removable cores unless job conditions warrant their use.
5. All supply devices shall have foam rubber or plastic gaskets around their outer frames or borders to prevent air leakage.
6. All air devices shall have quadrant-locking volume dampers. The use of operated opposed blade volume dampers is prohibited.

7. Supply grilles shall be of the double deflection adjustable blade type.
8. Mesh supply diffusers are not allowed.
9. Exhaust and return grilles and registers shall be of the fixed-blade type. These devices shall be positioned so they cannot be "seen through." Provide back box for ductwork connection, collar adapters shall not be permitted. Price 530L or equivalent.
10. Provide fire and/or smoke dampers as required by IBC. They shall be U.L. labeled dampers or equal and bear labels of compliance with fire and/or smoke rating. They shall be "high-hat" style to limit the amount of the shutter that is in the air stream.
11. Provide heavy-duty solid bar grille or register in high activity areas such as gymnasium.
12. Provide fabric ductwork in gymnasiums and natatoriums. Provide soft start for unit serving area.
13. Ceiling diffusers shall be louvered high induction directional type, with throw-patterns designed in response to space layouts. Provide back box for ductwork connection, collar adapters shall not be permitted. Price SMX or equivalent.
14. Air extractors and/or distribution grids shall be avoided.
15. Call for dampers having springs, pulleys, cables, and motor mounted outside of duct, for servicing, such as Prefco Products. Do not specify dampers requiring dismantling to service.
16. Use most efficient air distribution layout and devices consistent with building design.
17. VFD's should be required for supply and return air for all equipment servicing auditoriums or other performance spaces.

PRODUCTS

DUCTWORK AND PLENUMS

- A. Sheet metal ductwork shall be fabricated and installed in accordance with the recommendations of the latest ASHRAE guide, SMACNA Standards and NFPA Standards.
- B. Provide insulation of ductwork to reduce heat loss.
- C. Ductwork ends shall remain sealed at all times.
- D. Ductwork shall be sealed in accordance with SMACNA Standards. The use of foil tape is prohibited regardless of pressure class.
- E. No stove pipe shall be allowed. All spiral duct shall have locked seams.
- F. Use of adjustable elbows is not permitted.
- G. The use of 4-bolt connection systems for large rectangle and square ductwork is preferred.
- H. Non-metallic duct, insulated, shall be limited to 4'-0" in length.
- I. Blade type volume dampers: Constructed per SMACNA, one gauge heavier than duct material, securely fastened to 3/8 in. sq., cold rolled steel operator rod. Provide quadrant locking handle on air volume dampers.

- J. The use of spin-in wing-nut style volume dampers is prohibited.
- K. All 90 elbows up to 18" wide and all 45 elbows shall consist of an inside radius of not less than $\frac{1}{2}$ width of the duct or shall be furnished with single blade duct vanes with $2\frac{1}{4}$ " blade spacing.
- L. Ninety degree (90) elbows larger than 8" in either dimension shall be equipped with airfoil type duct vanes having an inside radius of $4\frac{1}{2}$ " and an outside radius of $2\frac{1}{4}$ " and shall consist of Tuttle & Bailey Type D, Elgin Manufacturing Corporation vane runners or equal, $2\frac{1}{4}$ " blade spacing.
- M. Shop fabricated duct vanes shall conform to the latest details of the SMACNA Sheet Metal and Air Conditioning contractor's Manual.
- N. Adequately sized access doors shall be provided in all air handling units and ducts for coil and filter removal, motor and fan lubrication, etc. Access doors shall be provided in the ductwork of sufficient size to service fire dampers, filters, etc. Provide access doors at both upstream and downstream side of each heating or A/C coil.
- O. Where ducts pass through walls or partitions, the openings shall clear the metal of the duct by 1". Provide 1.5" angle around all (4) sides of ductwork.
- P. Provide for support sleeves through masonry floors, walls, and ceilings. Where walls or floors are fire and/or smoke rated provide fire rating of penetration where it is necessary to make a change in the elevation of a duct, the change should be made as near a 30 angle as possible.
- Q. Show locations and sizes of access panels on drawings.
- R. Range hood exhaust duct construction shall be in accordance with current NFPA standards.
- S. Clothes dryer exhaust shall comply with the IMC (latest edition).
 - 1. Also provide in-line box style secondary lint trap that is accessible for maintenance.
 - 2. Provide UL listed booster fan if ductwork length exceeds manufacturer's recommendations:
 - 3. Fantech DEDPV-705 or approved equal.
- T. Exposed ductwork on roof is not permitted without District 20's specific approval.
- U. Air ducts in auditorium or other performance areas should be oversized with perforated lining to reduce air volume noise.
- V. Ceiling grid suspension wires may not be secured to ductwork.
- W. The use of shoe taps shall be utilized in-lieu of conical or bell mouth taps.

EXECUTION

FILTERS AND FILTER GAUGES

- A. Provide all new filters as 2" pleated filters, MERV-8 (or 11 for LEED) at startup.
- B. Remove construction filters and replace with new 2" pleated filters BEFORE test and balance contractor performs TAB activities. Provide new filters after TAB activities if warranted.
- C. Provide one full replacement set of filters to Academy School District 20 Project Manager upon project completion.

- D. Equipment shall not be operated for any reason without filters in place.

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Division 26 – Electrical

260500 COMMON WORK RESULTS FOR ELECTRICAL

GENERAL

SUMMARY

- A. Academy District 20 strives with these specifications to receive designs and equipment that will provide the best value for the available money. These guides are founded on considerable design and maintenance experience with the intent of reducing future maintenance problems, extending the trouble-free life of expensive equipment and energy conservation.
- B. These standards are directed primarily at licensed electrical contractors and outline minimum requirements for equipment, materials and methods for the School District. They are not intended as nor can they be used for inclusion without modification into a construction documents and specifications. The licensed electrical contractor must still select among design options, size and specify equipment and materials within budget and design limits imposed by the District for the affected building.
- C. General Installation:
 - 1. Provide and install a complete electrical system appropriate to the project which shall include all wiring and devices required for a complete operating system which includes electrical power, lighting, transformer (s), main distribution panel (s), disconnects, panel boards, wiring and wiring devices, fixtures switches, receptacles, connection to electrical service, Emergency electrical systems, an electrical permit, power for HVAC equipment, controls for HVAC equipment power for contractor provided equipment, power for District 20 provided equipment, surplus power for working requirements within building work spaces.
 - 2. Provide and install empty conduits, boxes and devices for telephone system and computer local area network. All new electrical components shall bear the UL label. Licensed electrical contractor shall do all electrical work. All electrical work accomplished for the School District is under the Colorado State Electrical Board. The contractor shall arrange for, at their expense, an electrical permit and inspection(s) by that agency.

CODES AND PERMITS

- A. All electrical work shall conform to the minimum standards set forth by the most recent edition of the National Electrical Code as adopted by the State unless a more stringent standard has been set in this specification.
- B. Permits and inspections shall be obtained through the Colorado State Electrical Board.

QUALIFICATIONS

- A. Licensed electrical contractor.
- B. Provide Journeyman Electrical Foreman in charge of work at all times. Foreman shall have experience in installing not less than 5 such electrical systems of equal or greater complexity. Maintain Journeyman/Apprentice ratio as required by Colorado State Electrical Board at all times.
- C. Only professional quality workmanship will be accepted. Haphazard or poor installation practice will be cause for rejection of work.

- D. Rejected work shall be replaced at the expense of the contractor.

EXECUTION

DRAWINGS

- A. Prepare the listed final As-Built drawings. Use the redlined drawings maintained by the contractor during construction.
1. One-line diagrams.
 2. Accurate routing of wiring.
 3. Locations of panels and loads.
 4. Point to point connection diagrams.
 5. Accurately locate buried conduit.
 6. Accurate circuit connection designations.

SITE VISITS AND OBSERVATION OF CONSTRUCTION

- A. Visit to site is required of all bidders prior to submission of bid. The contractor shall be familiar and aware of all discernible conditions, and no extra payment will be allowed for work required because of these conditions, whether specifically mentioned or not.
- B. Lines of other services and/or equipment that are damaged, as a result of this work shall be repaired promptly at no expense to District 20.
- C. Code compliance is mandatory. Nothing in the drawings and specifications permits work that does not conform to the most recent NEC.

MEDIUM-VOLTAGE CABLES

GENERAL

- A. Wiring:
1. THHN, THWN insulation.
 2. Copper - Pure.
 3. #12 AWG or larger, smaller wire allowed for control and signal wiring.
 4. All wiring is to be installed in a conduit system.
 5. No direct buried or open wiring will be accepted.
- B. The use of aluminum wire is prohibited.
- C. The use of copper clad wire is prohibited.
- D. The use of MC Cable is prohibited in most cases. Under certain circumstances, MC Cable may be used at specific locations with written permission from the District's representative prior to installation.

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PRODUCTS

GROUNDING ELECTRODES

- A. Rods: copper clad steel not less than 5/8 inch in diameter, ten feet long, driven full length into earth.

- B. Ground bushings, OZ types BLO or equal.
- C. For new installations, conduits of any kind shall not be used to provide the equipment grounding path. A properly sized equipment grounding conductor shall be installed with each circuit/conduit.

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PRODUCTS

METAL CONDUITS, TUBING, AND FITTINGS

- A. All interior conduits shall be installed in concealed locations unless designed specifically as a surface raceway system.
- B. Continuous ground wiring shall be provided in all conduits.
- C. Minimum Conduit Size: $\frac{3}{4}$ ".
- D. All conduits shall be no more than 30% full at the completion of the installation.
- E. PVC conduit shall not be installed above grade; only exception is sleeving of grounding conductors. Transitions shall be made at least 12 inches below grade.
- F. Provide long radius GRC sweeps for buried conduit in flat and vertical transitions.
- G. Exterior surface mounted conduit shall be galvanized rigid conduit. These conduits shall be installed flush to the exterior building finish and not installed so as they can be used to climb up.
- H. All conduits that penetrate firewalls shall be patched with fire stop grout.
- I. All conduits shall be supported per the National Electrical Code. Wire, perforated straps, etc. will not be accepted as a means of supporting conduit.
- J. All conduits shall be rigidly supported to building structure.
- K. Where project includes demolition and/or renovation of existing systems, remove existing circuits (wiring, raceways, devices, etc.) back to the nearest device or junction box which is intended to remain active after the project is complete. Do not leave abandoned circuits in place.
- L. KO seals shall be installed in junction boxes for all removed conduits.
- M. As a general rule, conduits shall not be run on building roofs. Conduits shall penetrate the roof as close to the equipment to be served as possible to minimize conduits being installed on the roof.
- N. $\frac{3}{4}$ " Liquid tight flex and flexible metal conduit limited to 6 feet unless approved ahead of time.
- O. EMT, GRC, PVC (PVC conduit can be used only underground), Liquid tight flex, flexible metal conduit. No AC, BX, MC, UF or any direct buried cable.
- P. All conductors must be installed in a properly sized conduit system per NEC.

SURFACE RACEWAYS

- A. Multi-channel divided for both power and data. Wiremold 4000 or equivalent.
- B. Metal Construction.
- C. Color: TBD.
- D. Tele-Power Poles, Wiremold ivory or selected by District 20.

- E. Single channel surface raceways shall be Wiremold 700 or equivalent.

UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PRODUCTS

CONDUIT

- A. Underground conduits shall be a minimum of 1 inch.
- B. PVC conduit can only be used underground.
- C. The use of buried service “Duct” is prohibited.

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PRODUCTS

ACCESS PANELS

- A. Electrical contractor to provide access panels for electrical equipment, which are required for accessibility by code.
- B. 24” x 24” minimum size.
- C. Fire rated where applicable.

EXECUTION

INSTALLATION

- A. Color Code all conductors.
- B. Where 120V branch circuits exceed 100LF, use #10 AWG to the first outlet.

IDENTIFICATION SCHEDULE

- A. 120/208 Volt Identify:
 - 1. Black A Phase
 - 2. Red B Phase
 - 3. Blue C Phase
 - 4. White Neutral
 - 5. Green Ground
- B. 277/480 Volt Identify:
 - 1. Brown A Phase
 - 2. Orange B Phase
 - 3. Yellow C Phase
 - 4. Gray Neutral
 - 5. Green/Yellow stripe Ground

LIGHTING CONTROL DEVICES

GENERAL

SUMMARY

- A. Design all lighting to specifications provided by Academy District 20, Energy Manager. Review lighting designs, levels and equipment selection with Energy Manager at earliest opportunity.
- B. Wattstopper is the only acceptable manufacturer.
- C. Wattstopper components shall be manufactured in the USA.

DRY-TYPE MEDIUM VOLTAGE TRANSFORMERS

GENERAL

REQUIREMENTS

- A. Low decibel type.
- B. Transformers feeding computer panels shall be K rated.
- C. 3-Phase transformers shall be dry type.
- D. Step down transformers shall be Wye type.

SWITCHBOARDS

GENERAL

EXAMINATION

- A. Examine area and conditions under which switchboards, panel boards and enclosures are to be installed, and notify District 20 in writing of conditions detrimental to proper completion of work. Do not proceed with work until unsatisfactory conditions have been corrected.

PRODUCTS

- A. Fused switches are prohibited on main gear.
- B. Provide TVSS/ surge protection on all main gear.

EXECUTION

- A. Provide typed panel schedule for all new panels. Identify circuit number, and location.
- B. Provide and install new, accurate, typed panel schedules at any/all times that breakers and/or circuits are modified or changed.

PANELBOARDS

PRODUCTS

- A. General Requirements for Panelboards:
 - 1. Copper busses.
 - 2. Panel fronts shall be hinged.
 - 3. Minimum of 42 circuits.

4. Bolt-in breakers only.
5. Breakers greater than 100 Amps shall be adjustable.
6. Load centers will not be accepted.
7. Accepted manufactures:
 - a. Square D.
8. Provide TVSS/ surge protection on all panels serving sensitive electronic equipment.

262726 WIRING DEVICES

PRODUCTS

MANUFACTURERS

- A. All wall switches, receptacles (single/duplex) LEVITON and HUBBELL industrial grade and shall be rated for 20 amps.
 1. Color: TBD
- B. All GFCI receptacles shall be LEVITON and HUBBELL commercial grade or equivalent.

GFCI RECEPTACLES

- A. Ground fault interrupters in accordance with National Electrical Code and also in the following areas. Locker/shower rooms, all outlets above counter tops with sinks in all school classrooms, in tunnels, in crawl spaces, within 6 feet of any sink including mop sinks, nurse rooms and teachers lounges.
- B. Each receptacle shall be provided with a properly sized copper equipment grounding conductor or self-grounding.

WALL PLATES

- A. Stainless steel or brushed nickel.
- B. Oversized where needed.
- C. Provide label identify panel and circuit serving said device.

PILOT LIGHT SWITCHES

- A. Provide in all mechanical, electrical, janitor, storage, and IDF rooms.

EXECUTION

INSTALLATION

- A. Switches and receptacles are not to be used for splicing or passing power to another device.

263213 ENGINE GENERATORS

PRODUCTS

MANUFACTURERS

- A. Cummins is the preferred engine manufacture with Onan transfer switch.
- B. Fuel type: TBD
- C. Provide service agreement for a minimum of one-year to include one major and one minor service visit.

263600 TRANSFER SWITCHES

GENERAL

SUMMARY

- A. This section includes transfer switches rated 600 V and less, including the following:
 - 1. Automatic transfer switches.
 - 2. Remote annunciation systems.
 - 3. Remote manual transfer switch.
 - 4. EPO Switches.

QUALITY ASSURANCE

- A. **Manufacturer Qualifications:** The equipment supplier shall maintain a service center capable of providing training, parts, maintenance and emergency repairs to equipment, including transfer switch generator sets and remote monitoring equipment (if applicable) at the site within a response period of less than (eight hours or appropriate time period designated for Project) from time of notification.
 - 1. The transfer switch shall be serviced by technicians employed by, and specially trained and certified by, the generator set supplier and the supplier shall have a service organization that is factory-certified in both generator set and transfer switch service. The supplier shall maintain an inventory of critical replacement parts at the local service organization, and in-service vehicles. The service organization shall be on call 24 hours per day, 365 days per year.
 - 2. Submit names, experience level, training certifications, and locations for technicians that will be responsible for servicing equipment at this site.
 - 3. The manufacturer shall maintain model and serial number records of each transfer switch provided for at least 20 years.
- B. **Source Limitations:** All transfer switches are to be obtained through one source from a single manufacturer. The generator set manufacturer shall warrant transfer switches to provide a single source of responsibility for products provided.
- C. **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 as suitable for use in emergency, legally required or optional standby use as appropriate for the connected load.
- D. **The automatic transfer switch installation and application shall conform to the requirements of the following codes and standards:**
 - 1. Transfer switches and enclosures shall be UL 1008 listed and labeled as suitable for use in emergency, legally required, and optional standby applications.
 - 2. CSA 282, Emergency Electrical Power Supply for Buildings, and CSA C22.2, No. 14-M91 Industrial Control Equipment.
 - 3. NFPA 70, National Electrical Code. Equipment shall be suitable for use in systems in compliance with Articles 700, 701 and 702.
 - 4. Comply with NEMA ICS 10-1993 AC Automatic Transfer Switches.
 - 5. IEEE 446 – Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications.

6. EN55011, Class B Radiated Emissions and Class B Conducted Emissions.
 7. IEC 1000-4-5 (EN 61000-4-5); AC Surge Immunity.
 8. IEC 1000-4-4 (EN 61000-4-4) Fast Transients Immunity.
 9. IEC 1000-4-2 (EN 61000-4-2) Electrostatic Discharge Immunity.
 10. IEC 1000-4-3 (EN 61000-4-3) Radiated Field Immunity.
 11. IEC 1000-4-6 Conducted Field Immunity.
 12. IEC 1000-4-11 Voltage Dip Immunity.
 13. IEEE 62.41, AC Voltage Surge Immunity.
 14. IEEE 62.45, AC Voltage Surge Testing.
- E. Comply with NFPA 99 – Essential Electrical Systems for Healthcare Facilities.
- F. Comply with NFPA 110 – Emergency and Standby Power Systems. The transfer switch shall meet all requirements for Level 1 systems, regardless of the actual circuit level.
- G. The manufacturer shall warrant the material and workmanship of the transfer switch equipment for a minimum of two (2) year from the warranty start date. The warranty start date is the date of registered commissioning and start up or eighteen (18) months from date of shipment, whichever is sooner.
- H. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, and etc. during the minimum noted warranty period described above.

PROJECT CONDITIONS

- A. Notify (District Project Manager) no fewer than (14) days in advance of proposed interruption of electrical service.
- B. Do not proceed with interruption of electrical service without (District Project Manager's) written permission.
- C. Do not energize any new service or distribution equipment without notification and permission of the (District Project Manager).

INTERIOR LIGHTING

GENERAL

- A. Must be approved by the Academy District 20 Electric Shop and meet the energy requirements of the School District Energy Manager.
- B. All interior lighting shall be LED.
- C. The use of pendent lighting is prohibited.
- D. Basis of Design: Lithonia, Cooper or approved equal.

EXTERIOR LIGHTING

GENERAL

- A. Must be approved with Academy District 20 Electric Shop and meet the energy requirements of the Academy District 20 Energy Manager.
- B. Basis of Design: Kim Lighting or approved equal.

EMERGENCY LIGHTING

GENERAL

- A. Emergency lighting shall be connected to the back-up generator.

EXECUTION

GENERAL INSTALLATION REQUIREMENTS

- A. All circuits for outside lighting shall be integrated into the buildings lighting control system.
- B. Exterior site lighting shall not exceed 30 feet in height to the top of the pole mounted luminaire and 20 feet if there is not direct access directly underneath the lighting luminaire.
- C. Concrete bases for exterior pole mounted lighting shall be steel reinforced with a #6cu., bonding the concrete steel reinforcing steel to the steel pole mounted on the concrete base.
- D. Concrete pole bases shall be a minimum of 40" above finish grade. Paint base yellow.
- E. All exterior light poles shall be steel, color TBD. Poles shall be rated for a minimum of 100 mph to meet configuration as shown on the Contract Documents and Specifications. That shall include any cameras or peripheral devices.
- F. Parking lot light poles or any other light pole shall have a steel reinforced concrete base that is 36 inches above grade if they are located within or closer than 3 feet from the edge of the parking lot. The depth and diameter of the concrete base shall be determined by the manufacturer of the steel light pole or a structural engineer.
- G. All exterior lighting installations shall meet the most recent requirements of the Colorado Springs guidelines pertaining to terrestrial lighting standards.
- H. Exterior building lighting fixtures shall be easily accessible from the ground directly below the light fixture and not be higher than 12 feet.

ADDRESSABLE FIRE-ALARM SYSTEMS

- A. Simplex is the only accepted manufacturer.
- B. All strobes shall be addressable.
- C. Fire Alarm Control Panels (FACP) shall be voice capable.

PUBLIC ADDRESS SYSTEM

PRODUCTS

- A. Valcom is the only accepted manufacturer.
- B. Provide a complete PA system with the following:
 - 1. Head-end equipment and display.
 - 2. Speakers.
 - 3. Call switches.
 - 4. Programming.
 - 5. Administration Phones with displays.
 - a. QTY: (2)

CLOCK SYSTEM

PRODUCTS

- A. Primex is the only accepted manufacturer.
- B. Provide a complete clock system with the following:
 - 1. Master Clock System.
 - 2. Transmitters.
 - 3. Wattage: TBD.
 - 4. Wall mounted clocks: Qty.: TBD.
 - 5. Provide wire guards in areas subject to damage.

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Division 27 – Communications

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Division 28 – Electronic Safety and Security

281500 ACCESS CONTROL HARDWARE DEVICES

PRODUCTS

CARD READERS, CREDENTIAL CARDS, AND KEYPADS

A. Subject to compliance with requirements, provide products by the following:

1. Basis-of-design product: Subject to compliance with requirements, provide product indicated on drawings or comparable product by one of the following:
 - a. DSX.
2. Card-reader power: Powered from its associated controller, including its standby power source, and shall not dissipate more than 5W.
3. Response time: Card reader shall respond to passage by generating a signal that is sent to the controller. Response time shall be 800 ms or less, from the time the card reader finishes reading the credential card until a response signal is generated.
4. Enclosure: Suitable for surface, semi-flush, pedestal or weatherproof mounting. Mounting types shall additionally be suitable for installation in the following locations:
 - a. Indoors, controlled environment.
 - b. Indoors, uncontrolled environment.
 - c. Outdoors, with built-in heaters or other cold-weather equipment to extend the operating temperature range as needed for operation at the site.
5. Display: Digital visual indicator shall provide visible and audible status indications and user prompts.
6. Stripe swipe readers: Bidirectional, reading cards swiped in both directions, powered by the controller. Reader shall be set up for ABA Track.
7. Wiegand swipe reader: Set for 33-bit data cards. Comply with SIA AC-01.
8. Wiegand key-insert reader: Set up for 33-bit cards.
9. Bar-code reader: Set up for code 128.
10. Insert reader: requiring the card to be inserted from the side, powered by the controller.
11. Touch-plate and proximity readers:
 - a. Active-detection proximity card readers shall provide power to compatible credential cards through magnetic induction.
 - b. Passive-detection card readers shall use a swept-frequency, RF field generator to read the resonant frequencies of tuned circuits laminated into compatible credential cards.
 - c. the card reader shall read proximity cards in a range from direct contact to at least 6 inches from the reader.

PUSH-BUTTON SWITCHES

- A. Momentary-contact back-lighted push buttons with stainless steel switch enclosures.

282000 VIDEO SURVEILLANCE

GENERAL*RELATED DOCUMENTS*

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

SUMMARY

- A. Section includes a video surveillance system consisting of cameras, digital video recorder/server, data transmission wiring, and a control station with its associated equipment. The contractor is responsible for providing and installing a complete “turnkey” Video Surveillance system that meets or exceeds the specification listed below.

DEFINITIONS

- A. AGC: Automatic Gain Control.
- B. BNC: Bayonet Neill-Councilman (type of connector).
- C. B/W: Black and White.
- D. CCD: Charge Coupled Device.
- E. FTP: File Transfer Protocol.
- F. IP: Internet Protocol.
- G. LAN: Local Area Network.
- H. MPEG: Moving Picture Experts Group.
- I. NTSC: National Television System Committee.
- J. PC: Personal Computer.
- K. PTZ: Pan-Tilt-Zoom.
- L. RAID: Redundant Array of Independent Disks.
- M. TCP: Transmission Control Protocol.
- N. UPS: Uninterruptible power Supply.
- O. WAN: Wide Area Network.
- P. RCDD: Registered Communications Distribution Designer.

ACTION SUBMITTALS

- A. Product data:
 - 1. For each type of product indicated, include dimensions and data of features, performance, electrical characteristics, ratings and finishes.
- B. Equipment list:
 - 1. Include every piece of equipment by model number, manufacture, serial number, location and date of original installation.

INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Data: Certificates, for cameras, camera-supporting equipment, accessories and components from the manufacture.
 - 1. Basis for certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- B. Field quality-reports.
- C. Product Warranty: Sample of special warranty.

CLOSEOUT SUBMITTALS

- A. Operations and Maintenance Data: For cameras, power supplies, infrared illuminators, monitors, videotape recorders, digital video recorders, video switches and control-station components to include in emergency, operation and maintenance manuals.
 - 1. Include the following: lists of spare parts and replacement components recommended to be stored at the site for ready access.

QUALITY ASSURANCE

- A. Installer qualifications
 - 1. Installer must have personal certified by BICSI on staff
 - 2. Layout responsibility; preparation of shop drawings and cabling administration, and field-testing program development by an RCDD.
 - 3. Installation supervision: Installation shall be under the direct supervision of a Registered Technician or Level 2 installer who shall be present all times when work of this section is being performed on site.
 - 4. Delete "Testing Supervisor subparagraph below if contractor performs field quality control.
 - 5. Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.
- B. Communications Cabling
 - 1. Contractor shall have (5) five years of documented experience performing cable placement, splicing, termination, connecting and testing for each of the media types and (3) three years of applicable experience with the proposed system manufacture.
 - 2. In the case of newer technology that does not have a three-year history, the contractor shall have documented experience for at least half of the lifetime of the new technology.
 - 3. The approved contractor shall, at a minimum, maintain a ratio of one manufacture or BICSI certified installer for every two non-certified installers assigned to the project.
 - 4. The contractor shall have on staff at least one BICSI Certified RCDD as a permanent employee. This staff member shall have been on staff for a minimum of one year prior to the data of this projects release for bid.

5. The contractor shall have on staff at least one BICSI Certified Technician and this staff member shall have been a full-time employee for no less than one year prior to the date of this projects release for bid.
6. A BICSI Certified Technician shall be employed as the on-site Field Supervisor for this project.
7. The contractor shall provide resumes for the Project Manager, Supervisors and any skilled technicians or installers. Each resume shall include applicable certification documents provided by the manufacture or BICSI.
 - a. Project manager, supervisors and Principal Skilled technicians: minimum of (5) five years' experience in like work.
 - b. Category 6 Unshielded Twisted Pair and Fiber Optic Technicians: documented training, licensing and/or certification for the types of media as specified, as applicable as well as certification from the manufacturer of the solution chosen by the District 20.

PROJECT CONDITIONS

- A. Environmental Conditions: Capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability.
 1. Control Station; Rated for continuous operation in ambient temperatures of 60 to 85 deg. F (16 to 29 deg. C) and relative humidity of 20 to 80 percent, noncondensing.
 2. Interior, Controlled Environment: System components, except central-station control unit, installed in temperature-controlled interior environments shall be rated for continuous operation in ambient temperatures of 36 to 122 deg. F dry bulb and 20 to 90 percent relative humidity, noncondensing. Use NEMA 250, Type 1 enclosures.
 3. Interior, Uncontrolled Environment: System components installed in non-temperature-controlled interior environments shall be rated for continuous operation in ambient temperatures of 0 to 122 deg. Dry bulb and 20 to 90 percent relative humidity, noncondensing. Use NEMA 250, Type R enclosure.
 4. Exterior Environment: System components installed in locations exposed to weather shall be rated for continuous operation in ambient temperatures of minus 30 to plus 122 F. dry bulb and 20 to 90 percent relative humidity, condensing. Rate for continuous operation when exposed to rain as specified in NEMA 250, winds up to 85 mph and snow cover up to 24 inches. Use NEMA 250, Type 3R enclosures.
 5. Security Environment: Camera housing for use in high-risk areas where surveillance equipment may be subject to physical violence.

WARRANTY

- A. Special Warranty: Manufactures standard form in which manufacture agrees to repair or replace components of cameras, equipment related to camera operation and control-station equipment that fail in materials or workmanship within specified warranty period.
 1. Warrant Period: One year from date of Substantial Completion.

PRODUCTS**DESCRIPTION****A. IP Video Systems**

1. Manufactures and Basis of Design; Subject to compliance with requirements, available manufactures offering products that may be incorporated into the work include, but are not limited to, the following:
 - a. Avigilon Security Solutions.
2. Description
 - a. System shall provide high-quality delivery and processing of IP-based video, audio and control data using standard Ethernet-based networks.
 - b. System design shall include all necessary compression software for high-performance, dual-stream and MPEG-2/MPEG-4 video. Unit shall provide connections for all video cameras, camera PTZ control data, bidirectional audio, discreet sensor inputs and control system outputs.
 - c. All camera signals shall be compressed, encoded and delivered onto the network for processing and control by the IP video-management software.
 - d. Encoder/decoder combinations shall place video, audio and data network stream that can be managed from multiple workstations on the user's LAN or WAN.
 - e. All system interconnecting cables shall be provided for full performance of specified system.

B. Camera-Supporting Equipment:

1. Manufacturers: Subject to compliance with requirements, available manufactures offering products that may be incorporated into the work include but are not limited to the following:
 - a. Avigilon Security Solutions.
2. Minimum load rating: Rated for load in excess of the total weight supported times a minimum safety factor of two.
3. Mounting brackets for fixed cameras: Type matched to items supported and mounting conditions. Include manual pan-tilt adjustment.
4. Protective housings for fixed movable cameras: Steel or 6061 T aluminum enclosures with internal camera mounting and connection provisions that are matched to camera/lens combination and mounting and installing arrangement of camera to be housed.

C. Standard Cameras:

1. Manufactures: Subject to compliance with requirements, available manufactures offering products that may be incorporated in the work include but are not limited to the following:
 - a. Avigilon Security Solutions.
 - b. Color camera:
 - i. Image sensor: progressive scan CMOS.

- ii. Active pixels: 1920(H) by 1080(V) pixels minimum.
- iii. Minimum illumination: 0.04 lux (F1.3) in color mode; 0.008 lux (F1.3) in monochrome mode.
- iv. Image rate: 20 fps. Minimum.
- v. Image compression method: H.264 (MPEG-4 part 10/AVC) and motion JPEG.
- vi. Streaming: multi-stream H. 264 and motion JPEG.
- vii. Electronic shutter control: automatic, manual.
- viii. Iris control: automatic, manual.
- ix. Day/night control: automatic, manual.
- x. Flicker control: 50 Hz, 60 Hz.
- xi. White balance: automatic, manual.
- xii. Privacy zones: up to 64 zones.
- xiii. Audio compression method: G.711 PCM 8 kHz.
- xiv. Audio input/output: line level input and output.
- xv. Network 100BASE-TX.
- xvi. API: ONVIF compliance version 1.02, 2.00.
- xvii. Security: password protection, HTTPS encryption, digest authentication, WS authentication, user access log, 802.1x port-based authentication.
- xviii. Protocol: IPv4, HTTP, HTTPS, SOAP, DNS, NTP, RTSP, RTCP, TCP, UDP, IGMP, ICMP, DHCP, Zeroconf, ARP.
- xix. Streaming protocols: RTP/UDP, RTP/UDP multicast, RTP/RTSP/HTTP/TCP, RTP/RTSP/HTTPS/TCP, HTTP.
- xx. Device management protocols: SNMP v2c, SNMP v3.
- xxi. Dome bubble: polycarbonate, clear.
- xxii. Power source: PoE IEEE802.3af class 3 compliant.

D. Network Video Recorder/Server:

- 1. Manufactures: subject to compliance with requirements, basis of design.
- 2. Avigilon Security Solutions.
- 3. General:
 - a. The District 20 representative shall provide specific requirements for the video surveillance server and equipment.
 - b. The video surveillance server shall be provided and installed by the contractor.
 - c. The video surveillance server shall be managed by existing District 20's data center.

E. Signal Transmission Components:

1. Cable: category 6 UTP plenum rated cable.

EXECUTION

EXAMINATION

- A. Examine pathway elements intended for cables. Check raceways and other elements for compliance with space allocations, installation tolerance, hazards to camera installation and other conditions affecting installation.
- B. Examine rough-in for LAN, WAN and IP network before device installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

WIRING

- A. Comply with requirements in section 270528 “Pathways for Communications Systems.”
- B. Wiring method: install cables in raceways unless otherwise noted.
 1. Exceptions:
 - a. Raceways are not required in accessible indoor ceiling spaces and attics.
 - b. Raceways are not required in hollow gypsum board partitions.
 - c. Conceal raceways and wiring except in unfinished spaces.
 2. For communication wiring, comply with the following:
 - a. Section 271300 “Communications Backbone Cabling.”
 - b. Section 271500 “Communications Horizontal Cabling.”
 3. Grounding: provide independent-signal circuit grounding recommended in writing by manufacture.

VIDEO SURVEILLANCE SYSTEM INSTALLATION

- A. Install cameras and infrared illuminators level and plumb.
- B. Install cameras with 84-inch minimum clear space below cameras and their mountings. Change type of mounting to achieve required clearance.

FIELD QUALITY CONTROL

- A. Tests and inspections:
 1. Inspection: Verify that units and controls are properly installed, connected and labeled and that interconnecting wires and terminals are identified.
 2. Pretesting: Align and adjust system and pretest components, wiring and functions to verify that they comply with specified requirements. Conduct tests at varying lighting levels, including day and night scenes as applicable. Prepare video-surveillance equipment for acceptance and operational testing as follows:
 - a. Prepare equipment list described in “Informational Submittals” article.
 - b. Verify operation of auto-iris lenses.
 - c. Set back-focus of fixed focal length lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Adjust until image is in focus with and without filter.
 - d. Set back-focus of zoom lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density

that produces a clear image. Additionally, set zoom to full wide and aim camera at an object 50 to 75 feet away. Adjust until image is in focus from full wide angle to full telephoto, with the filter in place.

- e. Set and name all preset positions; consult District 20's personnel.
 - f. Set sensitivity of motion detection.
 - g. Connect and verify responses to alarms.
 - h. Verify operation of control-station equipment.
3. Test schedule: schedule tests after pretesting has been successfully completed and system has been in normal functional operation for at least 14 days. Provide a minimum of 10 days' notice of test schedule.
 4. Operational tests: Perform operational systems tests to verify that system complies with specifications. Include all modes of system operation. Test equipment for proper operation in all functional modes.
 5. Video surveillance system will be considered defective if it does not pass tests and inspections.
 6. Prepare test and inspection reports.

ADJUSTING

- A. Occupancy adjustments: When requested within 12 months of date of substantial completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to project during other than normal occupancy hours for this purpose. Tasks shall include but are not limited to the following:
 1. Check cable connections.
 2. Check proper operation of cameras and lenses. Verify operation of auto-iris lenses and adjust back-focus as needed.
 3. Adjust all preset positions: consult District 20's personnel.
 4. Recommend changes to cameras, lenses and associated equipment to improve District 20's use of video surveillance system.
 5. Provide a written report of adjustments and recommendations.

CLEANING

- A. Clean installed items using methods and materials recommended in writing by manufacture.
- B. Clean video-surveillance-system components, including camera-housing windows, lenses and monitor screens.

DEMONSTRATION

- A. Train District 20's maintenance personnel to adjust, operate and maintain video-surveillance equipment.

284621.11 ADDRESSABLE FIRE-ALARM SYSTEMS

PRODUCTS

- A. Simplex is the only accepted manufacturer.

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Division 31 – Earthwork

EARTHWORK

GENERAL:

- A. Refer to Geotechnical Report regarding subsurface soil investigations.
- B. Contractor is responsible to obtain all required permits and inspections associated with site work as required by the following justifications:
 - 1. Local.
 - 2. State.
 - 3. Federal.
- C. Grading:
 - 1. Submit the following according to the Contract Documents and Specifications:
 - a. Test Reports: In addition to test reports required under field quality control, submit the following:
 - i. Laboratory analysis of each soil material proposed for fill and backfill from on-site and borrow sources.
 - ii. One optimum moisture-maximum density curve for each soil material.
 - iii. Report of actual unconfined compressive strength and/or results of bearing tests of each stratum tested.
 - 2. Preconstruction Conference:
 - a. Conduct conference at Project site to comply with requirements of the Contract Documents and Specifications.
 - b. Before commencing earthwork, meet with representatives of the governing authorities, District 20, architect, consultants, geotechnical engineer, independent testing agency, and other concerned entities. Review earthwork procedures and responsibilities including testing and inspection procedures and requirements. Notify participants at least three working days prior to convening conference. Record discussions and agreements and furnish a copy to each participant.
 - 3. Existing Utilities:
 - a. Do not interrupt existing utilities serving facilities occupied by the District 20 or others except when permitted in writing by the architect and affected District 20 and then only after acceptable temporary utility services have been provided.
 - b. Provide a minimum 48-hours' notice to the architect and the affected District 20 and receive written notice to proceed before interrupting any utility.

- c. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shutoff services if lines are active.
- 4. Soils Martial:
 - a. Fill Material:
 - i. Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, or crush slag free of vegetation, debris, or other objectionable materials. Fill materials shall conform to the following:
 - (A) Aggregate Base Course shall meet the requirements of the City of Colorado Springs Standard Specifications, Section 300, Aggregate for Bases, Class 2.
 - (B) Structural Fill: as required by Geotechnical Report.
 - (C) On-site non-organic soils obtained from excavation and over excavation of foundations may be used as structural fill. Additional structural fill required shall be imported from off-site.
 - ii. Satisfactory Soil Materials:
 - (A) ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM; free of rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation and other deleterious matter.
 - iii. Unsatisfactory Soil Materials:
 - (A) ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT.
- 5. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- 6. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.
- 7. Provide erosion control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- 8. Prevent surface water and subsurface or groundwater from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- 9. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.
- 10. Do not use explosives.

11. Unclassified Excavation:
 - a. Excavation is unclassified and includes excavation to required subgrade elevations regardless of the character of materials and obstructions encountered.
12. Comply with local codes, ordinances, and requirements of authorities having jurisdiction to maintain stable excavations.
13. Notify geotechnical engineer when excavations have reached required subgrade.
14. When geotechnical engineer determines that unforeseen unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
 - a. Unforeseen additional excavation and replacement material will be paid according to the Contract provisions for changes in Work.
15. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by the architect or District Project Manager.
16. Fill unauthorized excavation under foundations or wall footings by extending indicated bottom elevation of concrete foundation or footing to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position when acceptable to the architect.
 - a. Fill unauthorized excavations under other construction as directed by the architect or District Project Manager.
17. Where indicated widths of utility trenches are exceeded, provide stronger pipe, or special installation procedures, as required by the engineer.
18. Stockpile excavated materials acceptable for backfill and fill soil materials, including acceptable borrow materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent wind-blown dust.
 - a. Stockpile soil materials away from edge of excavations.
19. Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
 - a. Provide a smooth transition between existing adjacent grades and new grades.
 - b. Cut out soft spots, fill low spots, and trim high spots to conform to required surface tolerances.
20. Site Grading:

- a. Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
 - i. Lawn or Unpaved Areas: Plus or minus 0.10 foot.
 - ii. Walks: Plus or minus 0.10 foot.
 - iii. Pavements: Plus or minus 1/2 inch.

21. Grading Inside Building Lines:

- a. Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

22. Settling:

- a. Where settling occurs during the Project correction period, remove finished surfacing, backfill with additional approved material, compact, and reconstruct surfacing.
 - i. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

23. Disposal:

- a. Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off the District 20's property.
- b. Transport surplus satisfactory soil to designated storage areas on the District 20's property. Stockpile or spread soil as directed by architect.
- c. Remove waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off the District 20's property.

D. Excavation and Fill:

1. Stabilization Materials:

- a. Top 6 inches of pipe subgrade—Granular bedding material.
- b. Subgrade below 6 inches—Same as top 6 inches except that broken concrete and rock may be included in sizes permitting compaction as specified without discernible voids.

2. Bedding Materials:

- a. Concrete: Compressive Strength: 3,000 psi at 28 days minimum.
- b. Granular Material:
 - i. Angular or crushed, washed natural stone; free of shale, clay, frozen materials and debris; graded in accordance with ANSI/ASTM C136 within the following limits:

Sieve Size	Percent Passing
3/8 Inch	100
#4	95 - 100
#8	80 - 100
#16	50 - 85
#30	25 - 60
#50	10 - 30
#100	2 - 10

- c. Fine Granular Material: Natural or manufactured sand meeting the requirements of ASTM C33, gradation for fine aggregate (3/8" to No. 100).
3. Trench and Backfill Materials:
 - a. Excavated or imported material, free from frozen material, stumps, roots, brush, other organic matter, cinders, peat, or other corrosive material, debris, and rocks or stones greater than the following dimensions:
 - i. 3 inches in any dimension for material placed within one foot of finished surface.
 - ii. 2 inches in any dimension for material placed within one foot of pipe.
 - iii. 12 inches in any dimension for remainder of trench provided they are distributed in finer material.
 4. Clearing:
 - a. Remove all stumps, roots, brush, other vegetation, and debris from areas that will be disturbed by the construction operations.
 - b. Legally dispose of all cleared materials at public or private dumping areas off the District 20's property.
 5. Topsoiling:
 - a. Strip existing topsoil from areas to be disturbed by construction operations. Keep topsoil segregated from non-organic trench excavation materials and debris.
 6. Bedding Pipe:
 - a. Place material under and around the pipe as shown on the drawings using the bedding material specified.
 - b. Employ a placement method so as not to disturb or damage pipe.
 - c. Support pipe during placement and compaction of bedding fill.
 - d. Hand chink bedding around and under pipe to compact bedding material around the haunches of the pipe.
 7. Trench Backfilling:

- a. Backfill trenches to contours and elevations. Do not backfill over porous, wet or spongy subgrade surfaces. Backfill as early as possible.
 - b. Place and compact select fill materials in continuous layers not exceeding 8 inches loose depth.
 - c. Place and compact common fill material in continuous layers.
 - d. Remove surplus backfill materials.
 - e. Leave stockpile areas completely free of excess fill materials.
8. Compaction:
 - a. Maintain optimum moisture content of backfill materials to attain required compaction density.
 - b. Within one foot of the top of the pipe, care should be taken to avoid damage to the pipe through compaction.
 - c. In general, backfill shall be mechanically compacted by means of tamping rollers, sheeps foot rollers, pneumatic tire rollers, vibrating rollers, or other mechanical tampers.
 - d. Compaction requirements are as follows based upon the maximum Modified Proctor Dry Density, ASTM D1557:
 - i. Building Footprints: 95%.
 - ii. Paved Roadways, Sidewalks and Other Areas to Receive Pavement: 95%. Gravel Roadways: 95%.
 - iii. All Other Areas: 95%.
 - e. Compaction by jetting shall not be permitted unless material is of suitable granular material as determined by the engineer. In no case will compaction by jetting be permitted in State Highways or paved or gravel roadways.
9. Verify that stockpiled fill to be reused is approved.
10. Verify that areas to be backfilled are free of debris, snow, ice, or water, and that ground surfaces are not frozen.
11. Final Grading:
 - a. Fine grade all areas disturbed by the construction operations after completion of backfilling and compacting. Areas which are to receive pavements, surfacing, topsoil, or landscaping shall be graded as required to allow installation of the specific surface treatment. Grade all other areas to match the existing ground line.
12. Surface Improvement Repair and Replacement:

- a. Replace and repair any surface improvements damaged or removed. Meet the requirements specified for the particular type of improvement to be repaired or replaced.

E. Erosion and Sediment Controls:

1. This work shall consist of temporary measures needed to control erosion and water pollution. These temporary measures shall include, but not limited to, berms, dikes, dams, sediment basins, fiber mats, netting, gravel, mulches, grasses, slope drains, and other erosion control devices or methods. These temporary measures shall be installed at the locations where needed to control erosion and water pollution during the construction of the project, and as directed by engineer, and as shown on the Contract Drawings and Specifications.
2. The Erosion Control Plan presented in the Contract Documents and Specifications serves as a minimum for the requirements of erosion control during construction. The contractor has the ultimate responsibility for providing adequate erosion control and water quality throughout the duration of the project. Therefore, if the provided plan is not working sufficiently to protect the project areas, then contractor shall provide additional measures as required to obtain the required protection. The contractor shall include in the bid price for erosion control a minimum of all items shown on the Erosion Control Plan and any additional items that may be needed to control erosion and water pollution.
3. All temporary and permanent erosion and sediment control practices shall be maintained and repaired as needed to ensure continued performance of their intended function.
4. The erosion control features installed by contractor shall be adequately maintained by contractor until the project is accepted.
5. Stabilization of Disturbed Areas:
 - a. Temporary sediment control measures shall be established within five (5) days from time of exposure/disturbance.
 - b. Permanent erosion protection measures shall be established within five (5) days after final grading of areas.
6. Stabilization of Sediment and Erosion Control Measures:
 - a. Sediment barriers, perimeter dikes, and other measures intended to either trap sediment or prevent runoff from flowing over disturbed areas shall be constructed as a first step in grading and be made functional before land disturbance takes place.
7. Storm Sewer Inlet Protection:

- a. All storm sewer inlets which are made operable during construction or which drain stormwater runoff from a construction site shall be protected from sediment deposition by the use of filters.
 - b. The use of straw bales is not permitted.
8. Seeding per Contract Documents and Specifications.
 - a. Seeding shall be conducted during regional “seeding window.”
 - b. Seeded areas shall have blanket applied for slopes of 3:1 and less.
 - c. Hydro seeding shall be applied on slopes greater than 3:1.
9. All temporary erosion and sediment control measures shall be disposed of within thirty (30) days after final site stabilization is achieved or after the temporary measures are no longer needed as determined by District 20.
10. Trapped sediment and other disturbed soil areas resulting from the disposition of temporary measures shall be permanently stabilized to prevent further erosion.
11. Substantial Completion of Erosion Control Measures:
 - a. At the time specified in the Contract Documents and Specifications, and subject to compliance with specified materials and installation requirements, contractor shall receive a Substantial Completion Certificate for temporary erosion control measures.
 - b. Maintenance of Erosion Control Measures after Substantial Completion: contractor shall be responsible for maintaining temporary erosion control measures as specified in the Contract Documents and Specifications until such time as work has been accepted by District 20.
12. Final Completion and Acceptance of Erosion Control Measures:
 - a. After engineer and District 20 have determined that the drainage area has stabilized, contractor shall remove all remaining temporary erosion control measures.
 - b. Any damage to the site shall be repaired to the satisfaction of engineer and at no cost to District 20.
- F. Protection/ Repair of Existing Trees:
 1. All trees within area available to the contractor for construction shall be protected with orange safety fence around the trunk and dripline of the tree.
 2. When setting up construction limits lines for construction, construction access and material storage, the contractor shall fence or similarly protect restricted zones around all trees. These restricted zones shall extend from dripline to dripline. In any areas where the restricted zones must be violated, it shall be done only with the approval by the city forester. If access is allowed within these areas the use of heavy construction equipment shall be severely restricted in order to mitigate soil compaction and damage to tree roots.

3. If tree roots larger than three (3) inches in diameter are encountered when digging or trenching they shall be tunneled under for the placement of pipe, or other improvements. Where tree roots smaller than three (3) inches in diameter are in direct conflict with the exact final physical location of any of the proposed improvements, the roots shall be hand pruned with a saw. Do not tear the roots out. The removal of three (3) inches or larger diameter roots encountered during construction will not be allowed.
4. Aeration: If areas inside the restricted zone become compacted, the contractor shall use a grow gun or equal to fracture the soil. Fracturing penetration shall be 5' on center throughout the compacted areas.
5. Supplemental watering shall be applied with a deep root feeder, with about 100 gallons per tree per week if loss of ground cover (grass) or heating of the tree roots occur during construction.
6. No chemicals shall be applied or used around or near existing trees.
7. Continue to protect trees throughout the completion of construction.
8. When construction is complete, remove orange safety fence from around trees.
9. If it appears that the completion of the construction may cause damage to the branches of any trees, the contractor shall contact the District Project Manager. The District Project Manager will make a determination as to whether such damage is eminent. If so, the contractor shall enlist the services of a qualified arborist to prune the trees to facilitate the construction.
10. For each tree erroneously removed or damaged beyond repair, an assessment shall be withheld for the contractor's progress payments. This assessment shall be equal to the value of the tree prior to damage as determined by the District Project Manager.
11. In addition to paying the assessment, the contractor shall replace each damaged tree with nursery grown material of the same or approved species and approved size.

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Division 32 – Exterior Improvements

ASPHALT PAVING

GENERAL

SUMMARY

- A. Asphalt Parking Lots: Provide and install hot mix asphalt and base as indicated below.

Heavy Vehicles	5" Asphalt on 12" Base	(Bus & Trash Trucks)
Passenger Vehicles	4" Asphalt on 8" Base	
Playgrounds	3" Asphalt on existing grade	
	OR	
	2" Asphalt on 4" Base	

- B. Asphalt Sub-Grade Preparation: Remove topsoil and sterilize soil prior to installing base or asphalt.

EXECUTION

SURFACE PREPARATION

- A. Asphalt Condition Prior to Seal Coat: All asphalt shall be sound before seal coating. All structural defects shall be repaired with hot mixed asphalt and all cracks filled with rubberized crack filler conforming to ASTM D-3405-78. The pavement shall be cleaned with compressed air and a broom type sweeper and all caked on dirt shall be water flushed. Two coats of asphalt emulsion sealer shall be applied in accordance with manufacturer's recommendations, including non-skid aggregate skid prevention. Install latex striping to match existing or previous.
- B. Asphalt Seal Coat: shall be an emulsified binder with a minimum of two (2) percent polymer, specified mineral fillers, and non-asbestos fibers to produce a smooth homogeneous material and meet the following requirements.
1. Uniformity: No separation of water coagulation of the bituminous base or settlement of suspended matter that cannot be overcome by moderate agitation.
 2. Weight:
 - a. 10.00 - 11.50 pounds per gallon at 77 degrees F.
 - b. ASDTM D-2939.
 3. Residue by evaporation: 47% minimum.
 4. Non-volatile matter soluble: 15%-30% in trichloroethylene.
 5. Flammability: No tendency to flash or ignite.
 6. Cone Penetration: Pass ASTM D-217 at 77 degrees F.
 7. Weathering: Pass Fed Spec TTC-555B, Sect 4.4.6; 2-year exposure.
 8. Resistance to Wind/Rain: Pass Fed Spec TTC-555B, Sect 4.4.7; 98 miles per hour.
 9. AASHTO T-44: Pass.
 10. Conform to: FAA spec P-626A.

HOT-MIX ASPHALT PLACING

- A. Per Pikes Peak Region Asphalt Paving Specifications (PPRAS).
- B. Per City of Colorado Springs City Engineering Division General Provisions and Standard Specifications (COCS).

JOINTS

- A. Per City of Colorado Springs City Engineering Division General Provisions and Standard Specifications (COCS).
- B. Asphalt Crack-filling Compound: shall conform to the following:
 - 1. ASTM D 3405 78: Sealing Compound, hot applied for concrete and asphalt pavement.
 - 2. Mil Spec FAA P625: Aggregate, Medium black slag sand.
- C. Cracks shall be cleaned manually with compressed air and other appropriate tools, to remove all debris to a minimum depth of ½" plus the depth of bond breaker. Provide and install an effective bond breaker prior to installing crack filling compound. Crack filling compound shall be hot and fluid when applied. Cracks shall be filled full and "mounded up" so that the top of the crack-filling compound is flush with adjacent surfaces after shrinkage.

COMPACTION

- A. Per Pikes Peak Region Asphalt Paving Specifications.
- B. Per City of Colorado Springs City Engineering Division General Provisions and Standard Specifications (COCS)

INSTALLATION TOLERANCES

- A. Per Pikes Peak Region Asphalt Paving Specifications.
- B. Per City of Colorado Springs City Engineering Division General Provisions and Standard Specifications (COCS).

PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors and placement have been verified with architect.
- B. Markings in standard stalls should be white.
- C. Handicapped stalls should have blue markings and use current graphics.
- D. All striping shall be 4" wide.

WHEEL STOPS

- A. Wheel stops are prohibited in most cases. In certain circumstances, wheel stops may be used at specific locations with written permission from the District's representative prior to installation.
- B. Securely attach wheel stops to pavement with not less than two galvanized-steel dowels embedded at one-quarter to one-thirds points.

ASPHALT MAINTENANCE

- A. Asphalt Maintenance: Where asphalt maintenance is specified, all cracks larger than 1/8" shall receive crack filling. The entire asphalt surface shall receive seal coating, and this will cover cracks smaller than 1/8". Cracks wider than 1" shall be repaired by removing asphalt to a width of 6" and replacing the asphalt with new asphalt on

existing base. Removal may be accomplished with a jack hammer. Potholes and areas of unsound asphalt shall be removed and replaced with new asphalt on existing base.

CONCRETE PAVING

GENERAL

QUALITY ASSURANCE

- A. Per City of Colorado Springs City Engineering Division General Provisions and Standard Specifications (COCS).

FIELD QUALITY CONTROL

- A. General: The following tests and procedures are subject to change during construction at the discretion of the District 20.
- B. Testing Laboratory: The selection of a testing laboratory for any of the following tests shall be subject to the approval of the District 20.
- C. Test Priority: Control tests shall be used to determine the concrete quality throughout the project; however, special tests shall have precedence over controls tests, and core tests shall have precedence over all previous tests.
- D. Slump Tests: The contractor shall provide all necessary equipment and shall make tests in conformity with C143 as frequently as directed by the architect. The tests shall be made by a person thoroughly familiar with requirements specified. Should the slump exceed the limits stated in Section 03300 the batch shall be rejected. The contractor shall keep accurate record of the time, location in the work, and the results of all slump tests, which shall be available for review by the District 20 and the architect.
- E. Control Tests: Control tests of concrete work shall be made a minimum of once during each day's pour. Each test shall consist of six standard 6" test cylinders cast and cured in accordance with C31 and C172. Two cylinders shall be broken at the end of seven days after placing, two cylinders shall be broken at the end of 28 days after placing, and the remaining two cylinders shall be stored until the engineer determines their disposition. In general, the two remaining cylinders will be broken only when the previous test reports indicated unsatisfactory results. The engineer reserves the right to stop all future concrete work when the 7 or 28 day tests indicate unsatisfactory results until, in his opinion, proper corrective measures have been taken to insure quality concrete in future work or all corrections deemed necessary have been made. Tests shall be made at the time control tests are taken and so stated in the reports to determine the slump, air content, unit weight and temperature of the concrete. All tests shall be made in accordance with C391, C138, or C231.

EXECUTION

EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace and secure edge forms, bulkheads and intermediate screed guides to required lines, grades and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

FLOAT FINISHING

- A. Do not add water to concrete surfaces during finishing operations.
- B. Float finish: Medium-to-fine textured broom finish.

PAVEMENT MARKING

- A. Do not apply pavement marking paint until layout, colors and placement have been reviewed by the architect.

COLORED CONCRETE

- A. Use colored concrete in accordance with City of Colorado Springs and ADA standards for all handicap ramps.
 - 1. Colored concrete shall not be utilized in any other areas except as specifically approved by the District 20.
 - 2. Cast Iron truncated dome plates are acceptable in-lieu of colored concrete dome sections.

EXTERIOR CONCRETE STAIRS

- A. Concrete stairs shall have heat-treated corrosion resistant, extruded aluminum nosing with satin/lacquered finish and diamond-hard aluminum oxide filler.

POURED-IN-PLACE RESILIENT MATTING**GENERAL**

- A. Playground Design and new Playground Fall Surfaces: shall comply with the guidelines contained in the “Handbook for Public Playground Safety” published by the U.S. Consumer Product Safety Commission. Existing playground equipment shall be relocated only as required to meet the clearance requirements of section 11 of the handbook. New timber perimeters shall be installed as required to meet the clearance requirements of section 11 of the handbook. New fall surfaces shall comply with the requirements of section 10 of the handbook. New playgrounds and fall surface areas shall be designed such that existing drainage patterns and drainage elements are maintained and free flowing without causing migration of the pea gravel.

PRODUCTS***RESILIENT MATTING MATERIAL***

- A. New resilient matting material shall be a seamless, poured-in-place, hand-troweled application. The surfacing system shall consist of a rubber SBR cushion layer and a top EPDM rubber granule wearing course. All rubber granules shall be bound together with a polyurethane binder. The entire system is poured over a compacted aggregate base course. The thickness of the layers shall be from manufactures recommendations based on possible fall height.
- B. The following manufactures and products have been specified as those which are pre-approved and accepted as equal due to warranty, guarantee and materials required for maximum strength and durability.
 - 1. “Pebble Flex” by Landscape Structures.
 - 2. “Surface America” by Tatonka Playgrounds.
 - 3. “Playbound” by Surface America.
 - 4. “Spectrapur” by Spectra Turf Global Surfacing Systems.

SITE FURNISHINGS

- A. Direct bury for site furnishings preferred

- B. Surface mount with anchor to top of concrete is acceptable, with written permission from D20's project representative.
- C. Bike racks, litter receptacles, benches, picnic tables, etc.

IRRIGATION

GENERAL

- A. No pre-built swing joints.
- B. No MP rotor nozzles for pop-up zones.
- C. Provide standard-spray nozzles for pop-up zones.

PRODUCTS

MATERIALS

- A. 2-wire systems shall be properly grounded per industry standards.
- B. Large area sprinkler systems (athletic fields):
 - 1. Materials:
 - a. Pipe: Mains: PVC Class 200 rating, Solvent welded.
 - b. Pipe: Lateral Lines: PVC Class 160, Solvent Welded.
 - c. Fittings: PVC Schedule 40 or 80.
 - d. Heads:
 - i. Large Area Coverage- Rainbird, gear driven rotor – Sized appropriately.
 - ii. Small Area Coverage- Rainbird 1800 –any height.
 - e. Valves: Rainbird PEB Series.
 - f. Wire: Size - #10 AWG solid.
 - g. Valve Box: Ametek, Carson or equal with snap – lock lids.
 - h. Controller: Rainbird ESP, Lockable Enclosure Wall Mount for exterior. Use Plastic Lockable Cabinet for Interior Use.
 - i. Backflow Preventers: Febco – Models 825y, 825YA, 880V, 880, 860, 765, 850, 805, 870, 876V, (805, 825 ¾" thru 2" only).
 - 2. Installation details:
 - a. Pipe Depth – Mainlines 21" cover, Laterals 18" cover.
 - b. Install swing joints on each gear driven sprinkler head.
 - i. The use of pre-manufactured swing joints is prohibited.
 - c. Install a PVC Ball Valve upstream of each zone valve and PVC Unions at each valve. Use valve box extensions wherever necessary. Valve type will be as specified in materials list.
 - d. Install Thrust Blocks on the Main Line as Needed to Meet Industry Standards.

- e. Control Wires will be bundled and run on the underside of main line wherever possible. No underground splices will be permitted. Spices will only be permitted when wire runs are over 1000 feet. Control wire box will be installed at these locations. Extra wires will be run from the controller to the last valve box on the system one extra common and one extra live wire for every 8 zone wires.
- f. Live wires – Red or Orange.
- g. Common/Ground – White.
- h. Extra Common – Yellow.
- i. Extra Live wires – Green or Blue.
 - i. Sleeves shall be installed for all piping and wires that are ran under sidewalks or other hard surfaces.

C. Ornamental Sprinkler Systems:

1. Materials:

- a. Pipe: Mains: PVC Schedule 40, Solvent welded.
- b. Pipe: Lateral Lines: Poly.
- c. Fittings: PVC Schedule 40 or 80.
- d. Large Area Coverage- Rainbird, gear driven rotor – Sized appropriately.
- e. Small Area Coverage- Rainbird 1800 –any height.
- f. Valves: Rainbird PEB Series.
- g. Wire: Size - #10 AWG solid.
- h. Valve Box: Ametek, Carson or equal with snap – lock lids.
- i. Controller: Rainbird ESP, Enclosure Wall Mount for exterior Use Plastic Lockable Cabinet for Interior Use.
- j. Backflow Preventors: Febco – Models 825y, 825YA, 880V, 880, 860, 765, 850, 805, 870, 876V, (805, 825 ¾" thru 2" only).

2. Installation details:

- a. Pipe Depth – Mainlines 18" cover, Laterals 12" cover.
- b. Install pre-manufactured swing joints on all gear driven sprinkler heads.
- c. Valve box extensions wherever necessary. Valve type will be as specified in materials list.
- d. Control Wires will be bundled and run on the underside of main line wherever possible. No underground splices will be permitted. Spices will only be permitted when wire runs are over 1000 feet. Control wire box will be installed at these locations. Extra wires will be run from the controller to the last valve box on the system. One extra common and one extra live wire for every 8 zone wires.
 - i. Live wires – Red or Orange.
 - ii. Common/Ground – White.

iii. Extra Common – Yellow.

iv. Extra Live wires – Green or Blue.

D. Low-Volume/Drip Sprinkler Systems:

1. Materials:

- a. Backflow Preventers: Febco – Models 825y, 825YA, 880V, 880, 860, 765, 850, 805, 870, 876V, (805, 825 ¾" thru 2" only).
- b. Sleeves: Class 160 or SDR 35 PVC sewer and Drain Pipe.
- c. Supply Lines/Point of Connection: Type K Copper W/Silver Solder used on joints.
- d. Main Lines: Class 200 PVC Pipe Bell End for Solvent Welding.
- e. Lateral Lines: Class 160 PVC Pipe Bell Ended for Solvent Welding.
- f. Fittings for Solvent Welding: Schedule 40.
- g. Threaded Nipples: Schedule 80.
- h. Fittings for Flexible Plastic Pipe: Type 1 ASTM 2609.
- i. Clamps: Stainless Steel, Screw Type or Ear Type Clamps.
- j. Fittings for Drip Systems: Type and make as recommended by tubing manufacturer.
- k. Manual Drain Valves: Bronze Body, Angle Type 200 lb. class.
- l. Automatic Control Valves: Rainbird 1" Xerigation Commercial.
- m. Quick Coupler Valves: 2 Piece, 150 psi Rated, Brass Construction.
- n. Sprinkler Heads: Rainbird Xerigation Drip Emitters.
- o. Single-port Emitters: Pressure compensating type with outlets supplying 1 gallon (gph).
- p. Two Emitters for Shrubs.
- q. Three Emitters for Evergreen Trees.
- r. Four Emitters for Deciduous Trees.
- s. Automatic Controllers: Rainbird ESP Series, Enclosure – Wall Mount for Exterior, Plastic Lockable for Interior use.
- t. Valve Box: Ametek, Carson or equal with snap – lock lids.
- u. Control Wires: #10 AWG.
- v. Wire Connectors: Socket Seal Type and Water.

2. Installation details:

- a. Pipe Depth – Mainlines 18" cover, Laterals 12" cover.
- b. Install fittings, valves, and accessories in accordance with manufacturer's recommendations, unless specified otherwise.
- c. Valve box extensions wherever necessary. Valve type will be as specified in materials list.

- d. Control Wires will be bundled and run on the underside of main line wherever possible. No underground splices will be permitted. Splices will only be permitted when wire runs are over 1000 feet. Control wire box will be installed at these locations. Extra wires will be run from the controller to the last valve box on the system. One extra common and one extra live wire for every 8 zone wires.
- e. Live wires – Red or Orange.
- f. Common/Ground – White.
- g. Extra Common – Yellow.
- h. Extra Live wires – Green or Blue.

329000 PLANTING

PRODUCTS

A. Seed Mix:

- 1. Native: Low Grow, equivalent to Rocky Mountain Native Mix by Buffalo Co.
- 2. Turf/Sod: 70/30, Bluegrass/Rye.
- 3. Provide blanket on all seeding. Typical for seed and hydroseed.

B. Trees/Ornamentals:

- 1. No fruit trees.
- 2. Type that is appropriate for elevation.
- 3. Low water type.
- 4. Mulch with edging rings as required around tree/ornamental.
- 5. Full size mulch beds are prohibited.

C. Irrigation:

- 1. Drip: Trees and ornamentals.
- 2. Head-to-Head Coverage: Athletic fields only.
- 3. Stream-to-Stream Coverage: Establishing native grass and sod only.

D. Accessories:

- 1. Edging: 4" tall, 12 gauge, galvanized or power coat, rolled top edge, interlocking end-piece construction. Provide 10 gauge tapered stakes. Minimum of 5 stakes per 10'-0" piece.
- 2. Landscaping Fabric:
 - a. Planting beds: Mirafi MSCAPE
 - b. Cobble/Rock mulch: Mirafi 1100N

E. Warranty:

- 1. Irrigation: One-year parts, equipment, and labor.

2. Plantings: One-year replacement, 6 months additional for replaced plantings.
3. Native Grass: Until 80% establishment is achieved.
4. Sod: One-year replacement, 6 months additional for replaced sod.

323113 CHAIN LINK FENCES AND GATES

1. Provide PVC coated fence fabric

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Division 33 – Utilities

SITE UTILITIES

GENERAL:

- A. All utility construction shall be completed to pertinent City of Colorado Springs Utilities Standards and Specifications, Latest Edition as revised. All stormwater management system construction shall be completed to pertinent City of Colorado Springs, Engineering Division Standards and Specifications, Latest Edition, as revised.
- B. The contractor is responsible for obtaining public and private utility locates.
- C. The contractor shall be responsible to provide control staking for the facilities construction.
- D. Construction staking will be the responsibility of the contractor.
- E. The contractor shall obtain all necessary permits and licenses to complete the work and shall maintain the minimum statutory insurance requirements indemnifying the District 20 for all facility work.
- F. The contractor shall provide one-year warranty on all material and installation of all facilities.
- G. All Utility service lines shall be installed to within five feet (5') of the proposed building footprint and shall be plugged and clearly marked with a 2 x 4 from the invert of the service line to 24"/36" above adjacent finished grades. The contractor shall maintain accurate as-built information on all facilities installed and shall provide a Drawing of same to the District 20 upon completion of Construction.
- H. The contractor shall coordinate his work with the work of the Colorado Springs Utilities Electric Division and Colorado Springs Utilities Gas Division.
- I. The contractor shall coordinate his work with the local telephone and cable provider.

SANITARY SEWERAGE:

- A. All work covered by this section shall be governed by the Standard Specifications for Water and Wastewater Utilities issued by Colorado Springs Utilities. The following sections are contract minimum; the more stringent will be followed. Before beginning the work obtain a copy of the most recent edition of the Standard Specifications.
- B. Certification: Submit manufacturer's certification that products meet requirements of referenced specifications, in accordance with the Conditions of the Contract and CSU Specification sections.
- C. Shop Drawings: Submit drawings and data showing details of joints, gasket material and pipe length, in accordance with the Conditions of the Contract and CSU Specification sections.
- D. Do not damage the pipe and fittings by impact, bending, compression or abrasion during handling and storage.
- E. Store pipe on a flat surface, which provides even support for the barrel with bell ends overhanging.

- F. Do not stack pipe higher than 5 feet.
- G. Do not use pipe and fittings stored in direct sunlight for periods in excess of six months.
- H. Ship rubber gaskets in cartons and store in clean area away from grease, oil, ozone producing electric motors, heat, and the direct rays of the sun.
- I. Use only nylon protected slings or bands to handle pipe. Do not use hooks or bare cables.
- J. Provide tracer wire and warning tape.
- K. Sanitary Utility Sewerage Piping:
 - 1. Polyvinyl Chloride (PVC) Pressure Pipe (3/4" To 3", Inc.):
 - a. Reference Standard: ASTM D-2241 SDR 21.
 - b. Joints: Solvent/weld.
 - c. Fittings: Schedule 40.
 - d. Compression Couplings: PVC.
 - e. Threaded Adapter: Schedule 40 (Mipt x Slip).
 - 2. Polyvinyl Chloride (PVC) Sewer Pipe and Fittings (4" To 15", Inc.):
 - a. Pipe and Fittings Reference Standard: ASTM D303.
 - b. Class: DR 35.
 - c. Joints: ASTM D3212.
 - d. Gaskets: ASTM F477.
 - 3. Joint Installation for PVC Pipe (3/4" To 3", Inc.):
 - a. Remove all dirt and foreign material from the pipe ends with solvent.
 - b. Apply cement furnished by the pipe manufacturer to the spigot end of the pipe.
 - c. Insert the spigot to the reference mark, according to manufacturer's recommendations.
 - d. Do not disturb previously installed joints during jointing operations.
 - e. Install a compression coupling within 12" of any piece of equipment, valve or meter.
 - f. Install threaded adapters where necessary to meet threaded connections or valves and equipment.
 - 4. Joint Installation for PVC Pipe (4" To 12", Inc.):
 - a. Push-On-Joints:
 - (A) Clean the inside of the bell and the outside of the spigot to remove dirt, oil, excess coating, and other foreign matter.
 - (B) Insert the gasket.
 - (C) Apply a thin film of lubricant to either the inside surface of the gasket, the spigot end of the pipe, or both.
 - (D) Do not permit the joint surface to come into contact with the ground.

- (E) Assure that pipe is marked with a depth mark before assembly to assure the spigot end is inserted the full depth of the joint.
- (F) Complete the joint making certain the spigot is inserted to the depth mark.
- (G) Do not use excessive force in joining the pipe.
- b. Mechanical Joints:
 - i. Remove dirt, oil, grit, excess coating, and other foreign matter from the inside of the bell and the outside of the spigot.
 - ii. Apply a thin film of lubricant to the inside of the bell, the outside of the spigot and the gasket.
 - iii. Tighten nuts alternately on opposite sides of the pipe to produce equal pressure on all parts of the gland.
 - iv. Use a torque limiting wrench and do not exceed the following maximum torque values:

Bolt Size	Torque (Ft./Lbs.)
5/8"	--
3/4"	60 - 90
1"	70 - 100
1-1/4"	90 - 120
 - v. Holes in mechanical joint bells shall straddle the top (or side for vertical piping) centerline.
 - vi. Secure tube type polyethylene encasement on all fittings by taping to insert pipe.
- c. Flanged Joints:
 - i. Extend pipe completely through screwed-on flanges.

WATER UTILITIES:

- A. All work covered by this section shall be governed by the Line Extension Service Standards (LESS) issued by Colorado Springs Utilities. The following sections are contract minimum; the more stringent will be followed. Before beginning the work obtain a copy of the most recent edition of the Standard Specifications.
- B. Prior to the placement of this section, verify that all work of other trades is sufficiently complete to allow this installation to proceed and verify that all such work enables the work of this section to be completed in accordance with the Contract Documents and Specifications. In the event of discrepancy, immediately notify the District 20's representative and architect and proceed as directed.
- C. Water lines shall be constructed a minimum of ten feet from the center of all sanitary sewer and storm sewer lines, except where they cross.
- D. Minimum trench width at the top of the pipe shall be one pipe diameter plus six- inches on both sides.
- E. When it is necessary to raise or lower water lines at sanitary sewer crossings, a minimum clearance of 1.50 feet shall be maintained between outside of pipes.

- F. Backfilling shall not occur until pipe has been inspected.
- G. Compaction of trenches shall be 90 percent density in accordance with ASTM D1557 standard proctor density.
- H. Hydrostatic testing and flushing shall be accomplished in accordance with City of Colorado Springs Water Division Specifications.
- I. Grade and alignment: A maximum deviation of plus or minus five tenths (0.5) of a foot from alignment will be permitted, and where the pipeline is to be laid to a specific grade shown on the plans, a maximum deviation of three tenths (0.3) of a foot will be permitted.
- J. Bacteriologic Tests:
 - 1. After completion of the final flushing and prior to placing the pipeline in service, collect samples from the end of the line and test for bacteriologic quality to show the absence of coliform organisms. The number and frequency of samples shall conform to the requirements of the public health authority having jurisdiction, but in no case shall the number be less than one of chlorinated supplies and two collected 24 hours apart for unchlorinated supplies.
 - 2. Collect samples in sterile bottles from a standard corporation stop, yard hydrant or tap installed in the main. Run sufficient water to clear the service line to the main prior to collecting the sample. Do not collect samples using a hose or fire hydrant.
 - 3. The contractor shall include such bacteriologic tests as part of the work, the cost of which shall be included in the pipe installation cost.
 - 4. If the original disinfection fails to produce a satisfactory sample, repeat the disinfection procedure until satisfactory results are obtained.
- K. Water Utility Distribution Piping:
 - 1. Polyvinyl Chloride (PVC) Pressure Pipe (3/4" To 3", Inc.):
 - a. Reference Standard: ASTM D-2241 SDR 21.
 - b. Joints: Solvent/weld.
 - c. Fittings: Schedule 40.
 - d. Compression Couplings: PVC.
 - e. Threaded Adapter: Schedule 40 (Mipt x Slip).
 - 2. Polyvinyl Chloride (PVC) Pressure Pipe (4" To 12", Inc.):
 - a. Reference Standard: AWWA C-900 (Ductile Iron O.D.).
 - b. Pressure Class:
 - i. DR 18 (150 psi) where shown on the Contract Documents and Specifications.
 - c. Joints: Bell ends with elastomeric gaskets.
 - d. Fittings: Cement Mortar Lining, ANSI A21.4 (AWWA C-109).
 - i. Mechanical Joints:
 - (A) Ductile Iron, ANSI A21.53/AWWA 153.

- (B) Gaskets, ANSI A21.11/AWWA 111.
 - ii. Flanged Joints:
 - (A) Ductile Iron ANSI A21.10/AWWA C-110.
 - (B) Drilling: ASA - B16.1, Class 125.
 - iii. Polyethylene Encasement: AWWA C-105.
3. Joint Installation for PVC Pipe (3/4" To 3", Inc.):
- a. Remove all dirt and foreign material from the pipe ends with solvent.
 - b. Apply cement furnished by the pipe manufacturer to the spigot end of the pipe.
 - c. Insert the spigot to the reference mark, according to manufacturer's recommendations.
 - d. Do not disturb previously installed joints during jointing operations.
 - e. Install a compression coupling within 12" of any piece of equipment, valve or meter.
 - f. Install threaded adapters where necessary to meet threaded connections or valves and equipment.
4. Joint Installation for PVC Pipe (4" To 12", Inc.):
- a. Push-On-Joints:
 - i. Clean the inside of the bell and the outside of the spigot to remove dirt, oil, excess coating, and other foreign matter.
 - ii. Insert the gasket.
 - iii. Apply a thin film of lubricant to either the inside surface of the gasket, the spigot end of the pipe, or both.
 - iv. Do not permit the joint surface to come into contact with the ground.
 - v. Assure that pipe is marked with a depth mark before assembly to assure the spigot end is inserted the full depth of the joint.
 - vi. Complete the joint making certain the spigot is inserted to the depth mark.
 - vii. Do not use excessive force in joining the pipe.
 - b. Mechanical Joints:
 - i. Remove dirt, oil, grit, excess coating, and other foreign matter from the inside of the bell and the outside of the spigot.
 - ii. Apply a thin film of lubricant to the inside of the bell, the outside of the spigot and the gasket.
 - iii. Tighten nuts alternately on opposite sides of the pipe to produce equal pressure on all parts of the gland.
 - iv. Use a torque limiting wrench and do not exceed the following maximum torque values:

Bolt Size	Torque (Ft./Lbs.)
5/8"	--
3/4"	60 - 90
1"	70 - 100
1-1/4"	90 - 120

- v. Holes in mechanical joint bells shall straddle the top (or side for vertical piping) centerline.
- vi. Secure tube type polyethylene encasement on all fittings by taping to insert pipe.
- c. Flanged Joints:
 - i. Extend pipe completely through screwed-on flanges.
 - ii. Machine finish the pipe and end flange face in a single operation.
 - iii. Eliminate any restraints on the pipe which would prevent uniform gasket compression or cause unnecessary stress in the flanges.
 - iv. Do not assemble mechanical connections until all flanged joints affected thereby have been tightened.
 - v. Alternately tighten bolts spaced on opposite sides of the pipe to assure uniform gasket compression.
 - vi. Holes in flanges shall straddle the top (or side for vertical piping) centerline.
 - vii. Secure tube type polyethylene encasement on all fittings by taping to insert pipe.
- d. Mechanical Couplings:
 - i. Clean and smooth pipe ends.
 - ii. 1/4 inch to less than one-inch space between pipe ends.

STORM DRAINAGE UTILITIES:

- A. All work covered by this section shall be governed by the Standard Specifications for the City of Colorado Springs. The following sections are contract minimum; the more stringent will be followed. Before beginning the work obtain a copy of the most recent edition of the Standard Specifications.
- B. Environmental Compliance: Comply with applicable portions of local environmental agency regulations pertaining to storm sewerage systems.
- C. Utility Compliance: Comply with local utility regulations and standards pertaining to storm sewerage systems.
- D. Site Information: Perform site survey, research public utility records, and verify existing utility locations. Verify that storm sewerage system piping may be installed in compliance with original design and referenced standards.
- E. General Locations and Arrangements: Drawings (plans and details) indicate the general location and arrangement of the underground storm sewerage system piping. Location and arrangement of piping layout take into account many design considerations. Install the piping as indicated, to the extent practical.

- F. Install piping beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Provide grouted rip-rap to prevent scouring of headwall/sides of pipe headwalls. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings in accordance with manufacturer's recommendations for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line and pull past each joint as it is completed.
- G. Use manholes or catch basins for changes in direction, except where a fitting is indicated. Use fittings for branch connections, except where direct tap into existing sewer is indicated.
- H. Use proper size increasers, reducers, and couplings, where different size or material of pipes and fittings are connected. Reduction of the size of piping in the direction of flow is prohibited.
- I. Install piping pitched down in direction of flow, at minimum slope indicated.
- J. Extend storm sewerage system piping to connect to building storm drains, of sizes and in locations indicated.
- K. Testing: Perform testing of completed piping in accordance with local authorities having jurisdiction.
- L. Cleaning: Clear interior of piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed.
 - 1. In large, accessible piping, brushes and brooms may be used for cleaning.
 - 2. Place plugs in ends of uncompleted pipe at end of day or whenever work stops.
 - 3. Flush piping between manholes, if required by local authority, to remove collected debris.
- M. Interior Inspection: Inspect piping to determine whether line displacement or other damage has occurred.
 - 1. Make inspections after pipe between manholes and manhole locations has been installed and approximately 2 feet of backfill is in place, and again at completion of project.
 - 2. If inspection indicates poor alignment, debris, displaced pipe, infiltration, or other defects, correct such defects and reinspect.

PRODUCTS:

- A. Fabric:
 - 1. Geotextile woven or spun filter fabric, in one or more layers, for minimum total unit weight of 4.0 oz per sq. yd. (148 g/sq. m).
- B. Identification:
 - 1. Plastic Underground Warning Tapes: Polyethylene plastic tape, 6 inches wide by 4 mils thick, solid green in color with continuously printed caption in black letters "CAUTION – STORM LINE BURIED BELOW".

2. Pipe and Fittings:
 - a. See the “Standard Specifications for the City of Colorado Springs Engineering Division,” for Joint Materials and Installation.
3. Catch Basins:
 - a. Construct catch basins to sizes and shapes indicated.
 - b. Set frames and grates to elevations indicated.
4. Pipe Bedding:
 - a. Pipe bedding - after completion of the trench excavation and proper preparation of the foundation, a minimum of 2 inches and a maximum of 6 inches of bedding material shall be placed on the trench bottom for support under the pipe. Bell holes shall be dug deep enough to provide a minimum of 2 inches of clearance between the bell and bedding material. All pipe shall be installed in such a manner as to ensure full support of the pipe barrel over its entire length. After the pipe is adjusted for line and grade and the joint is made, the bedding material shall be carefully placed and tamped under the haunches of the pipe up to the spring line and in the previously dug bell holes. The bedding shall then be installed to a minimum of 6 inches and a maximum of 12 inches above the top of the pipe, no matter what type of pipe is installed.

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