



Denver Public Schools
Construction Services / Strategic Sourcing
1617 S. Acoma St.
Denver, Colorado 80223
14-MC-8896

PROJECT MANUAL



SCHOOL DISTRICT NO. 1 IN THE
CITY AND COUNTY OF DENVER AND STATE OF COLORADO

**PROJECT: Bradley International School General
Renovations**

**LOCATION:
Bradley International School**

**Project #
PP8896**

BID #: 14-MC-8896

DATE: February 5, 2014

Architect

Mark Hoskin Architects
200 Quebec St. Building 600 Suite 201
Denver, CO 80230

DENVER PUBLIC SCHOOLS
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VENDOR ACKNOWLEDGEMENT

Purpose: The purpose of this Solicitation is to provide Denver Public Schools a bid for Bradley International School General Renovations described in the Scope of Work/Specifications and the Agreement.

Date: February 5, 2014
 Proposal number: Bid No.: 14-MC-8896
 Proposal title: Bradley International School General Renovations

Mandatory Pre-Bid Conference February 5, 2014, 2:00 pm at
 Bradley International School
 3051 S. Elm St.
 Denver, CO 80222

**Bids will be received until: February 25, 2014
 2:00 PM, Local Denver Time
 at 1617 S. Acoma St., Denver, CO 80223**

For additional information please contact:
 Email Address Michael Craig, Strategic Sourcing
 Michael_craig@dpsk12.org

Documents included in this package:
 Vendor Acknowledgement
 Instructions to Vendors
 Bid Form
 Bid Bond Form
 Performance and Payment Bond Form
 Illegal Alien Certification Form
 Contractor Safety Statement
 Construction Agreement
 Construction Agreement Exhibits
 General Conditions
 Scope of Work/Specifications

The undersigned hereby affirms that (1) he/she is a duly authorized agent of the Vendor, (2) he/she has read all terms and conditions, technical specifications and all other Solicitation Documents which were made available in conjunction with this Solicitation and fully understands and accepts them, (3) that the offer is being submitted on behalf of the Vendor in accordance with any terms and conditions set forth in this document, and (4) that the Vendor will accept any awards made to it as a result of the offer submitted herein for a minimum of ninety (90) calendar days following the date of submission.

VENDOR PRINT OR TYPE YOUR INFORMATION

(Include this form in your proposal)

Name of Company: _____ Fax: _____
 Address: _____ City/State: _____ Zip: _____
 Contact Person: _____ Title: _____ Phone: _____
 Authorized Representative's Signature: _____ Phone: _____
 Printed Name: _____ Title: _____ Date: _____
 Email Address: _____ Approved by: _____ Date: _____

**SCHOOL DISTRICT NO. 1 IN THE
CITY AND COUNTY OF DENVER AND STATE OF COLORADO
INSTRUCTIONS TO VENDORS**

*****ALL PRE-BID MEETINGS WILL START PROMPTLY AT THE TIME STATED, ANY VENDOR ARRIVING AFTER THE SCHEDULED TIME WILL NOT BE PERMITTED TO BID*****

In addition to matters appearing in the Base Bid form, all vendors shall pay close attention to the following:

SCHEDULE OF ACTIVITIES: The following activities outline the process to be used to solicit vendor responses and to evaluate each vendor proposal.

January 16, 2014	Distribute Invitation to Bid
February 5, 2014	Mandatory pre-bid conference
February 19, 2014	Deadline for submitting questions
February 25, 2014	Bid due date
August 1, 2014	Substantial Completion
October 1, 2014	Final Completion

Sealed bids will be received by School District No. 1 in the City and County of Denver and State of Colorado at the Construction Services Offices (Mitchell Elementary), **1617 S. Acoma St., Denver, CO 80223**. Attn: **14-MC-8896 Until 2:00 PM on February 25, 2014**, at which time bids there will be a public bid opening.

Bids received after closing time of **2:00 P.M.** will be returned unopened.

The project is to be substantially completed by **August 1, 2014**. The entire project is to be completed in time to be accepted by the District on or before **October 1, 2014**, or as otherwise provided for in the specifications.

- 1 Bid Forms:** All forms used must be the forms prepared by the District. They include the following:

Base Bid

Bid Bond (unless the required Bid Guaranty is in the form of a cashier's or certified check).

"BDOP Participation Report" submitted to BDOP (Business Diversity Outreach Program (formerly HUBS)) Coordinator within three (3) working days of bid date

Proof of Advertisement: For bids of \$250,000 and above, the Contractor shall submit as part of bid documentation, a copy of contractor's advertisement inviting bids from BDOP contractors as specified in the General Conditions

All blank spaces in these forms must be completely and correctly filled in with ink or typewriter. In case of conflict between words and numerals, the words will govern, unless obviously incorrect. A bid must be submitted on all alternates listed.

The Bid Bond (if this type of Bid Guaranty is used) must be accompanied by a duly executed Power of Attorney from the surety company.

NOTE: If Bid is by:

Individual

The person signing the Bid should state below his signature that he is the sole owner of his business.

Partnership

The partner signing the Bid should state that he is a partner of the firm making the bid.

Corporation

The officer signing the Bid must be the president or vice president of the corporation. He must state his title and make certain that the seal of the corporation is affixed and attested by the secretary or assistant secretary of the corporation.

Anyone signing a Bid as agent must submit with the Bid evidence proving that his signature thereto is binding upon his principal.

- 2 Submitting Bid:** Bids must be submitted in duplicate (one original and one copy) in sealed envelopes marked as follows: (Faxed bids are not acceptable)

Name and Address of Vendor Bidding

Denver Public Schools

Construction Services Strategic Sourcing Department

1617 S. Acoma St.

Denver, CO 80223

ATTN: 14-MC-8896

Time of Opening: (Write on envelope the date and time set for the opening of bids.)

If delivered: Denver Public Schools, Construction Services (Mitchell Elementary, 1617 S. Acoma St., Denver, CO 80223 – attn: 14-MC-8896 Strategic Sourcing Dept. If bids are delivered on date due, it is suggested that vendors arrive one-half hour early to allow sufficient time for parking and receiving. There is limited parking on the street. Limited visitor parking is available in the paved DPS lot.

If mailed: Denver Public Schools, Attn: 14-MC-8896 Strategic Sourcing Dept., 1617 S. Acoma St., Denver, CO 80223.

If the bid is sent by mail, use registered mail. Enclose the sealed bid (envelope marked as indicated above) in the mailing envelope. No bid will be considered unless received prior to the time and at the place designated in the Advertisement for Bid.

Each bid must be submitted on a form prepared by School District No. 1 and must be accompanied by a Bid Guaranty in an amount not less than five per cent of the total bid price.

- 3 The Bid Guaranty** may be (1) a cashier's check, (2) a certified check, or (3) a bid bond submitted on a form prepared by the School District. The Bid Guaranty must be payable to the School District as a guaranty that the bid submitted will not be withdrawn for ninety days after the opening of the bids, and that, if the bid is accepted, the vendor will, within the prescribed time, enter into the required formal Agreement with the School District and furnish the required Contractor's Performance Bond and Certificates of Insurance, the amount of such Bid Guaranty to be paid to the School District as liquidated damages if such guaranty is not fulfilled.

- 4 Method of Award:** Award of individual contracts will be based upon the total amount of the base bid plus any alternates selected to be included in the contract. Selection of alternates will be based on the availability of funds. Alternates will be selected as judged by the District to provide the best value to the District within the funds available for the project.
- 5 Inconsistencies and omissions:** Any seeming inconsistencies between any plans or specifications or provisions of the contract documents, or any other matter seeming to require explanation, must be inquired into by the prospective vendor at least 72 hours (excluding Sundays and holidays) prior to the time set for the opening of bids. Decisions of major importance on such matters will be issued in the form of addenda. All addenda shall become part of the contract documents and receipt of the same by the vendor must be acknowledged on the Base Bid form.

If any prospective vendor notices that any sheet or page or other portion of the contract documents is missing, it shall be his responsibility to obtain such missing sheet, page or other portion.

- 6 Approvals:** Requests for approval of equal products or materials must be written and must be received by the architect at least seven (7) working days prior to the bid opening. Requirements for the form and content of such requests are included in the contract documents. No request for substitutions will be considered after bid opening.
- 7 ELIGIBILITY OF VENDORS - MUST BE ENGAGED IN SUPPLYING PRODUCTS OR SERVICES RENDERED:** Pre-award inspection of the Vendor's facility may be made prior to award of the contract. Solicitations will only be considered from firms which have been engaged in the business of manufacturing or distributing the goods and/or performing services as described in this solicitation. The Vendors must be able to produce evidence that they have an established satisfactory record of performance for a reasonable period of time and have sufficient financial support, equipment and organization to ensure that they can satisfactorily execute the services if awarded a contract. The term equipment and organization as used herein shall be construed to mean a fully equipped and well established company in line with the best business practices in the industry and as determined by the proper authorities of the District. The District reserves the right, before awarding the contract, to require a Vendor to submit such evidence of its qualifications as it may deem necessary, and may consider any evidence available to it (including, but not limited to, the financial, technical and other qualifications and abilities of the Vendor, including past performance and experience with the District) in making the award in the best interest of the District.

Local office shall be required: Due to the service level required in conjunction with this Solicitation, the Vendor shall maintain an office within the Colorado, area. This office shall be staffed by a competent company representative(s) who can be contacted during normal business hours and who is authorized to discuss matters pertaining to the contract.

Withdrawal of bids: Offers may be withdrawn prior to the time and date set for the opening. Such requests must be made in writing on company letterhead.

Offers may not be withdrawn after the time and date set for the opening for a period of ninety calendar days. If an Offer is withdrawn by the Vendor during this ninety day period, the District may, at its option, suspend the Vendor from the bid list and may not accept any Offer from the Vendor for a six month period following the withdrawal.

- 8 Applicable laws and regulations:** Each vendor will be assumed to be familiar with all state and local laws, charter provisions, codes, ordinances and regulations which might in any manner affect the work to be done or those to be employed in or about the work. No plea of misunderstanding or ignorance on the part of any successful vendor will in any way excuse such vendor from the necessity of full compliance with every such law, charter provision, code, ordinance and regulation.
- i. **Corporations and Partnerships:** Vendors on public contract for services shall comply with the provisions of CRS §8-17.5-101 et seq., which requires a Contractor to certify that the Vendor and its sub-contractors do not knowingly employ illegal aliens on public contracts for services. Non-compliance with certification requirements may result in penalties including termination of the awarded contract. If so terminated, Contractor shall be liable for all actual and consequential damages; or

- ii. **Sole Proprietorships and Individuals:** Vendors on public contract for services who are sole proprietors and persons eighteen years of age or older shall comply with the provisions of CRS §24-76.5-101 et seq., which requires the submission of a sworn affidavit that you are lawfully present in the United States before signing of the Agreement for any public benefit such as this contract. Any person who knowingly makes a false, fictitious, or fraudulent statement or representation in an affidavit shall be in violation of C.R.S. 18-8-503.

See the bid documents and the contract's general terms and conditions for additional information.

- 9 **Preference to Colorado Materials:** The work shall be done by materials produced or manufactured in Colorado, provided Colorado materials can be obtained in marketable quantities and provided that such preference need not be given to materials of a quality inferior to the quality of the materials offered by competitors outside the state, although a differential of not to exceed 5% may be allowed in cost of Colorado materials of equal quality, all as provided by law.
- 10 **Mandatory Pre-Bid Meeting:** All prospective vendors are required to attend a mandatory pre-bid conference commencing at **2:00 PM** local time, **on February 5, 2014, at Bradley International School 3051 S. Elm St. Denver, CO 80222.** Independent inspections of the sites may be conducted by the vendors Monday through Friday from 3:00 p.m. – 5:30 p.m. during the bid period. The vendors must check into the school's office to obtain a visitor's pass and must also check out of the office.
- 11 **Equal Opportunity:** The District intends and expects that the contracting processes of the school district and its contractors provide equal opportunity without regard to gender, race, ethnicity, religion, age, or disability and that its contractors make available equal opportunities to the extent third parties are engaged to provide goods and services to the school district as subcontractors, vendors, or otherwise. Accordingly, the contractor shall not discriminate on any of the foregoing grounds in the performance of the contract and shall make available equal opportunities to the extent third parties are engaged to provide goods or services in connection with performance of the contract. The Vendor shall disseminate information regarding all subcontracting opportunities under this contract in a manner reasonably calculated to reach all qualified potential subcontractors who may be interested. The contractor shall maintain records demonstrating its compliance with this article and shall make such records available to the Owner upon the Owner's request.
- 12 **Intent to Award Notice:** The recommendation for award shall be posted on the District's Strategic Sourcing Department web page at: (<http://purchasing.dpsk12.org/bids/default.asp>). It is the sole responsibility of the vendor to check the website periodically for the award recommendation. This shall serve as notice to all Vendors of the District's intent to make award to the lowest responsive/responsible Vendor(s). Vendors may request a copy of the tabulation sheet by emailing the buyer at brian_swift@dpsk12.org. If it is determined by the District that there are no Vendors that could be grieved by the award of this solicitation, The District reserves the right to waive or shorten the protest period and proceed with award.
- 13 **APPEAL OF AWARD.** Vendors may appeal by submitting, **in writing**, a detailed request for reconsideration to the District's Executive Director of Facility Management within 72 hours after the recommendation of award is posted on the Strategic Sourcing Department's web site at <http://purchasing.dpsk12.org/bids/default.asp>, provided that the appeal is sought by the Vendor prior to the District finalizing a contract with the selected vendor.
- 14 **Execution of Documents:** The vendor to whom the work is awarded will be required to execute three copies of the formal Agreement with the School District, on forms supplied by the District, to furnish, at the vendor's expense, three fully executed copies of the required Contractor's Performance and Payment Bond, and to furnish the requisite Certificates of Insurance and insurance endorsements, all within five (5) business days from the date of the Notice of Award. If such vendor fails to execute said Agreement and to furnish said Bond and Insurance documents within said five (5) day period, the District shall be entitled to collect the amount of such vendor's Bid Guaranty as liquidated damages, to consider all rights arising out of the District's acceptance of such vendor's Bid as abandoned and to award the work covered by such Bid to another, or to re-advertise the work, or otherwise dispose of the work, as the District may see fit.

15 Owner's Project Representative:

All questions regarding the Specifications and Contract Documents for this project shall be directed to:

DPS Strategic Sourcing: Michael Craig, Strategic Sourcing
Email: Michael_craig@dpsk12.org

16 Special Note to All Vendors: Each vendor shall be assumed to be familiar with the complete set of Contract Documents and to have given due consideration to all existing conditions and limitations under which the work is to be performed. The submission of a bid will be construed as conclusive evidence that the vendor has made such examination.

Vendor's failure to comply with all the requirements for bid including documents to be submitted therewith, the use of proper forms, their proper and complete execution including the filling in of all blank spaces therein, may well result in the rejection of bid.

The School District reserves the right to reject any or all bids, to waive any informalities, and to accept any bid deemed desirable.

17 LIQUIDATED DAMAGES FOR DELAY

The liquidated damages amount to be applied under Section 3.5 of the General Conditions of the Contract for delays in Substantial Completion is **\$500.00** per day.

The liquidated damages amount to be applied under Section 3.5 of the General Conditions of the Contract for delays in Final Completion is **\$1000.00** per day.

18 Rejection: Vendor's failure to comply with all the requirements for the bid including documents to be submitted therewith, the use of proper forms, their proper and complete execution including the filling in of all blank spaces therein, may result in a rejection of bid. This solicitation does not commit the District to award a contract, to pay any costs incurred in the preparation of a bid, or to procure or contract for the articles of goods or service. The District reserves the right to waive insignificant requirements, to accept or reject any or all bids or portions of bids for just cause received as a result of this request or to cancel in part or in its entirety this bid, if it is in the best interest of the District to do so.

DENVER PUBLIC SCHOOLS

SCHOOL DISTRICT NO. 1 IN THE CITY AND COUNTY OF DENVER
AND STATE OF COLORADO



CONTRACT DOCUMENTS

BID FORM

BASE BID

**TO: SCHOOL DISTRICT NO 1 IN THE
CITY AND COUNTY OF DENVER
AND STATE OF COLORADO**

PROJECT: Bradley General Renovations

LOCATION: Bradley International School 3051 S. Elm St. Denver, CO 80222

14-MC-8896

School	Bid Amount
Bradley Int. School	\$ _____
Add alternate 1: Auditorium lighting	\$ _____
Add alternate 2: Egress lighting	\$ _____
Add alternate 3: Auditorium HVAC	\$ _____

Name of Company: _____

Contact Person: _____ Title: _____ Date: _____

Authorized Representative's Signature: _____



14-MC-8896 Project Experience Qualifications Sheet

Must list 1 project of at least \$450,000 and 3 projects of at least \$270,000

Project	Value	Location	Owner	Reference Contact Name	Reference Contact phone

DENVER PUBLIC SCHOOLS SUPPLIER PORTAL

Effective July 1, 2014, all new business conducted with DPS will require you to be registered on the DPS Supplier Portal.

The Denver Public Schools (DPS) District is modernizing its Financial Management and Strategic Sourcing business processes to include two-way web-based communication with its Suppliers and Vendors. The benefits extended to our supplier/vendor business partners that register with DPS include:

- Electronic Bidding Events/Solicitations.
 - Bids and Proposals sent directly to your personal Supplier Portal account
 - On-line bid responses, negotiations, awards, and much more
- Direct submission of electronic invoices (depending on your contractual relationship).
- Complete view of your contracts, purchase orders, invoices and payments online through your "Supplier Portal".
- Ability to maintain your business profile, points of contact, diversity qualifications, list of commodities you wish to provide, W-9s, certifications and insurance documentation, along with optional subcontractor tracking.
- Historical record of your interaction and performance with DPS

Access to the supplier portal can be found here: <http://purchasing.dpsk12.org/>

Supplier Portal User Guides are available at same link (under the 'Suppliers/Vendors' link on the right-hand of the page).

**SCHOOL DISTRICT NO. 1
IN THE CITY AND COUNTY OF DENVER
AND STATE OF COLORADO**

PROJECT:

BID BOND

LOCATION:

KNOW ALL MEN BY THESE PRESENTS:

That we [the Contractor] _____ [hereinafter called "Principal"], and _____ [hereinafter called "Surety"], a corporation organized and existing under the laws of _____ and duly authorized to transact such business in Colorado, are held and firmly bound unto **School District No. 1 in the City and County of Denver and State of Colorado** [hereinafter called "Obligee"], in the sum of five per cent (5%) of the Principal's total bid price as lawful money of the United States, for the payment of which sum, well and truly to be made to the Obligee, the Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal is submitting a proposal, or bid, for the above described project for the Obligee, and said Obligee has required as a condition for receiving said proposal that it be accompanied by the specified Proposal Guaranty in an amount not less than five percent (5%) of the Principal's total bid price, in pursuance of which requirement this Bid Bond is made, executed, and delivered.

Now, the condition of this obligation is such that if the Principal shall maintain said proposal or bid in full force and effect for ninety days after the opening of the bids for such project, or, if the Principal's proposal or bid is accepted, the Principal shall, within the prescribed time, enter into the required formal Agreement with the Obligee, furnish the required Certificates of Insurance and furnish the required Contractor's Performance Bond, then this obligation shall be null and void, otherwise it shall remain in full force and effect.

Signed, sealed, and delivered this _____ day of _____, 20__

(SEAL)

PRINCIPAL

Attest:

By _____

By _____

Title _____

Title _____

(SEAL)

SURETY

By _____
Attorney-in-Fact

THIS BOND MUST BE ACCOMPANIED
BY A POWER OF ATTORNEY

SCHOOL DISTRICT NO.1
IN THE CITY AND COUNTY OF DENVER
AND STATE OF COLORADO

PERFORMANCE AND PAYMENT BOND

Bond No. _____ (the "Bond")

KNOW ALL MEN BY THESE PRESENTS that _____

_____, as Principal (the "Principal"), and _____

_____, a corporation organized and existing under the laws of the State of _____, and authorized to transact business in the State of Colorado, as Surety (the "Surety"), jointly and severally, bind themselves, their heirs, personal representatives, successors, and assigns to the SCHOOL DISTRICT NO.1 IN THE CITY AND COUNTY OF DENVER AND STATE OF COLORADO (the "Owner"), in the principal amount of _____ (\$ _____) as adjusted by approved change orders (not to exceed ten (10) percent of the principal amount of this Bond unless expressly approved by the Surety, which approval shall not be unreasonably withheld) and interest as provided by law (collectively referred to herein as the "Penal Sum"), for the performance of and payment of all amounts due under the agreement between the Principal and the Owner, dated _____, 20__, (the "Agreement") for the following project: _____ (the "Project"), together with the obligations of the Contract Documents, as defined in the Agreement, all of the documents are incorporated by this reference and shall be, collectively, referred to as, the "Contract".

The condition of this obligation is such that, if the Principal shall at all times duly, promptly, and properly perform all the terms and conditions of the Contract and any authorized modifications thereof during the original term of the Contract, any extensions thereof that may be granted by the Owner, and during the term of any guarantee or warranty required under the Contract; and promptly make payment of all amounts, claims, or demands lawfully due to all persons, firms, associations, or corporations supplying or furnishing to the Principal or its subcontractors labor or materials, supplies, or equipment which are used, provided, or performed in the prosecution of the work provided for in the Contract and any and all duly authorized modifications of the Contract that may hereafter be made, then the Principal and Surety shall have no obligation under this Bond, otherwise, it shall remain in full force and effect and the Surety shall pay the full value of all payment amounts, claims or demands lawfully due and shall indemnify and hold the Owner harmless from all payments which the Owner may be required to make under the Contract or applicable law in excess of the Contract price not exceeding the amount of this obligation, together with interest as provided by law, as well as attorneys' fees and costs incurred by the Owner in the resolution of any claim.

Whenever the Owner terminates the Contract in accordance with the terms thereof, the Surety shall, within fifteen (15) calendar days after written notice of such termination, notify the Owner in writing of its election to complete the Contract in accordance with its terms, or notify the Owner that the Surety elects not to complete the Contract. If the Surety fails to give the written notice so required within such time period, then it will be deemed to have elected not to complete the Contract. Should the Surety elect to complete the Contract, it shall, within fifteen (15) additional calendar days following the date of receipt of the written notice of such election and with the Owner's written approval, obtain a contractor to complete the work in accordance with the original Contract's terms and conditions and thereafter proceed to work with due diligence and as the work progresses make available sufficient funds to pay the cost of completion less the balance of the Contract price. The Surety may not engage the Principal to complete the Contract, without the prior written consent of the Owner, which consent may be withheld at the sole and absolute discretion of the Owner.

If the Surety elects to complete the Contract, then it shall be entitled to receive the balance of the Contract price, less (i) any amounts paid by the Owner to the Principal; (ii) costs incurred by the Owner in correcting any defective work; (iii) any additional legal, design professional, and other costs incurred by the Owner resulting from the Principal's default; and (iv) liquidated damages caused by delayed performance or nonperformance of the Principal. Any progress payments, less retainage, due but not paid at the date of termination shall be paid to Surety so long as the Surety has agreed to indemnify the Owner for the amount thereof and no other claims have been made to such funds by subcontractors or suppliers in accordance with the Contract or applicable law.

In the event the Surety elects not to complete the Contract, the Owner may then have the work completed by such means and in such manner, by contract with or without public bidding, or otherwise, as it may deem advisable. The Surety in such event shall at all times make available, sufficient funds, which at no time shall exceed the Penal Sum, as work progresses under the Contract between the Owner and its new contractor, and will pay the cost of the completion of the Contract pursuant to its terms, together with the other amounts set forth in sections (i) through (iv) above, but in no event shall the Surety be responsible for the payment of any sums to the Owner until the Owner has agreed to pay its total obligation according to the terms of the Contract, plus change orders, less deductions and claims chargeable by law or by the Contract, if any, and less the retainage which will be disbursed as proved by the Contract Documents and applicable law.

The procedures set forth herein shall apply should there be a default and termination or a succession of defaults and terminations in fulfilling the terms and conditions of the work under the Contract.

Any judgment recovered hereunder by the Owner shall include interest at the legal rate, together with reasonable attorneys' fees and costs.

IN WITNESS WHEREOF said Principal and Surety have executed this Bond, this _____ day of _____ A.D., 20_____.

Principal:

(PRINCIPAL'S CORPORATE SEAL)

ATTEST:

By: _____ Date: _____
Print Name: _____
Title: _____

By: _____ Date: _____
Print Name: _____
Title: _____

Surety:

(SURETY'S CORPORATE SEAL)

By: _____ Date: _____
Print Name: _____
Attorney-in-fact

THIS BOND MUST BE ACCOMPANIED BY A POWER OF ATTORNEY

Best's Rating: _____
Best's Financial Rating: _____
Date: _____

DENVER PUBLIC SCHOOLS
WORKER STATUS
CERTIFICATION STATEMENT REGARDING ILLEGAL ALIENS

[Reference HB 1343 – Certification]

CERTIFICATION STATEMENT FOR CORPORATIONS & PARTNERSHIPS

The Vendor, whose name and signature appear below, certifies and agrees as follows:

1. The Vendor shall comply with the provisions of CRS 8-17.5-101 et seq.
2. The Vendor shall not knowingly employ or contract with an illegal alien to perform work under this purchase order or enter into a contract with a subcontractor that knowingly employs or contracts with an illegal alien.
3. The Vendor represents, warrants, and agrees that it (i) has verified that it does not employ any illegal aliens, through participation in the Basic Pilot Employment Verification Program administered by the Social Security Administration and Department of Homeland Security, or (ii) otherwise shall comply with the requirements of CRS 8-17.5-102(2)(b)(I).
4. The Vendor shall comply with all reasonable requests made in the course of an investigation by the Colorado Department of Labor and Employment. If the Vendor fails to comply with any requirement of this provision or CRS 8-17.5-101 et seq., the School District may terminate the above referenced purchase order for breach and the Vendor shall be liable for actual and consequential damages to the School District.

CERTIFIED and AGREED to this _____ day of _____, 20__

Name of Firm (print)

Signature of Authorized Representative

Name of Authorized Representative (print)

Denver Public Schools Project Name

DENVER PUBLIC SCHOOLS
WORKER STATUS
AFFIDAVIT REGARDING ILLEGAL ALIENS

[Reference HB06:1023 – Certification]

AFFIDAVIT FOR SOLE PROPRIETORS & INDIVIDUALS

I, _____, swear or affirm under penalty of perjury under the laws of the State of Colorado that (check one):

____ I am a United States citizen, or

____ I am a Permanent Resident of the United States, or

____ I am lawfully present in the United States pursuant to Federal law.

I understand that this sworn statement is required by law because I applied for a public benefit. I understand that state law requires me to provide proof that I am lawfully present in the United States prior to receipt of this public benefit. I further acknowledge that making a false, fictitious, or fraudulent statement or representation in this sworn affidavit is punishable under the criminal laws of Colorado as perjury in the second degree under Colorado Revised Statute 18-8-503 and it shall constitute a separate criminal offense each time a public benefit is fraudulently received.

Signature

Date

Name (print)

Denver Public Schools Project Name



DENVER PUBLIC SCHOOLS – DEPARTMENT OF FACILITY MANAGEMENT
Construction Safety Standards Acknowledgement Form

I have been informed that the Construction Safety Standards have been made available to me and that it is an OSHA and U.S. Department of Labor requirement that I must provide a safe workplace environment free from safety hazards. The DPS Construction Safety Standards may be found at:

http://bond.dpsk12.org/construction_standards

I am aware that the terms of the Construction Agreement provide that all Contractors shall have a written Safety and Health Program Plan that complies with current laws regarding worker health and safety and the prevention of accidents or injury to persons on or about the site (including the Occupational Safety and Health Act of 1970 as amended, the standards issued by the Secretary of Labor at 29 CFR Part 1926 and 29 CFR Part 1910 as amended, safety laws of the State of Colorado, and other safety laws and regulations). These written plans shall be available for Owner's review at each worksite.

Each Contractor's employee is responsible for complying with applicable safety and occupational health requirements, wearing prescribed safety and health equipment, reporting unsafe conditions/activities, preventing avoidable accidents, and working in a safe manner.

Contractor's employees are required to wear the following minimum Personal Protective Equipment (PPE) while on Owner's worksite:

- A. Hard Hat
- B. Safety Glasses
- C. Safety Vest
- D. Safety Shoes
- E. Safety Gloves if activity requires hand protection
- F. Other PPE as appropriate for work activity

The Prime Contractor is responsible for ensuring subcontractor and sub-sub-contractor compliance with the safety and occupational health requirements as contained within the contractor's written Safety and Health Program Plan.

DATE: _____

SIGNATURE: _____

NAME: _____

COMPANY AND/OR CONTRACTOR:

Denver Public Schools

FACILITY MANAGEMENT
CONSTRUCTION SERVICES

TEL 720-424-5443

FAX 720-424-5465

WEB <http://fm.dpsk12.org>



Contractor Confined Space Safety Acknowledgement

FACILITY:

PROJECT NAME:

PROJECT NUMBER:

The Contractor has been advised that part or all of their work may be performed within an area designated as a "Confined Space" or "Confined Space – Permit Required" zone within a DPS facility.

The Contractor's responsibility is to perform all work in a safe manner to comply with all the terms of the Construction Agreement including having a written Safety and Health Program Plan that complies with current laws regarding worker health and safety and the prevention of accidents or injury to persons on or about the site (including the Occupational Safety and Health Act of 1970 as amended, the standards issued by the Secretary of Labor at 29 CFR Part 1926 and 29 CFR Part 1910 as amended, safety laws of the State of Colorado, and other safety laws and regulations).

It is the Contractor's responsibility to comply with 29 CFR 1910.146 of the Occupational Safety and Health Act Regulation Standards pertaining to entering and working in a designated Confined Space area.

By acknowledgement of this provision, Contractor assumes all responsibility in performance of their work according to standard best safety practices.

Contractor acknowledges they have been informed of the hazard(s) found within the designated area, and is aware there may be additional hazards not yet identified.

The Prime Contractor is responsible for ensuring subcontractor and sub-subcontractor compliance with the safety and occupational health requirements as contained within the contractor's written Safety and Health Program Plan.

DATE: _____

SIGNATURE: _____

PRINTED NAME: _____

COMPANY AND/OR CONTRACTOR: _____

DENVER PUBLIC SCHOOLS

SCHOOL DISTRICT NO. 1 IN THE CITY AND COUNTY OF DENVER

AND STATE OF COLORADO



Construction Agreement Construction Agreement Exhibits General Conditions

CONSTRUCTION AGREEMENT

This CONSTRUCTION AGREEMENT (this “Agreement”) is entered into this ____ day of _____, 20____, by and between **School District No. 1 in the City and County of Denver and State of Colorado** (the “Owner”) and _____ [full legal name], a _____ [state of formation and type of entity, e.g., “Colorado corporation,” “Colorado limited liability company,” etc.] (“Contractor”).

In consideration of the covenants and agreements contained in the Contract Documents, the sufficiency of which is hereby acknowledged by the Contractor and Owner, Contractor and Owner hereby promise and agree as follows:

Article 1. KEY TERMS; DESCRIPTION OF THE PROJECT

1.1 The Project. The “Project” consists of the construction of [an addition to] [a remodeling of] [a remodeling of part of] a building [or facility] known as _____.

The principal function of this [building/facility] is [will be] _____.

Owner’s project number for the Project is _____.

The Project may be further described on Exhibit A.

1.2 The Contract Sum.

1.2.1 The “**Contract Sum**” shall be the amount of \$_____, which shall be full compensation to the Contractor for all of the Work described in the Contract Documents.

1.2.2 General conditions costs shall be identified on the Schedule of Values, but there is no separate General Conditions Fee under this Contract.

1.2.3 There is no separate Contractor Fee under this Agreement. The Contract Sum includes Contractor’s profit and compensation for Contractor’s overhead and administrative expenses.

1.3 The Contract Documents. The “**Contract Documents**” include:

1.3.1 All written modifications or amendments to this Agreement, including Change Orders;

1.3.2 This Agreement, including all exhibits and attachments;

1.3.3 The General Conditions of the Contract;

1.3.4 Construction Documents prepared and approved in accordance with this Contract;

1.3.5 The following other documents, if any: _____.

The Contract Documents are intended to be complementary, and anything required by any of the Contract Documents shall be as binding as if required by all of the Contract Documents. In the event of inconsistencies in requirements between different parts of the Contract Documents, unless Owner otherwise agrees in writing, Contractor shall provide the better quality or greater quantity. In the event of any irreconcilable difference between different provisions of the Contract Documents, the provision or requirement set forth in the Contract Document first appearing in the list above shall control.

- 1.4 Contractor's Role in General; The Work.** Contractor accepts the relationship of trust and confidence established with the Owner by the Contract Documents. Contractor agrees to furnish efficient business administration and superintendence and to use its best efforts to perform the Work in the best and most sound way and in the most expeditious and economical manner consistent with the interests of the Owner, within the time periods provided in the Milestone Schedule.
- 1.5 Exclusions.** The scope of the Work shall not include, and Owner shall be responsible for, any items listed on Exhibit C.

Article 2. DEFINITIONS AND INTERPRETATION

2.1 Defined Terms.

- 2.1.1 Terms Defined in the General Conditions of the Contract.** Initially capitalized terms used but not defined in this Agreement shall have the meanings given them in the General Conditions of the Contract.
- 2.1.2 Agreement.** This Construction Agreement, including exhibits hereto.
- 2.1.3 Contract Sum.** Defined in Section 1.2.1 above.
- 2.1.4 Contract Documents.** Defined in Section 1.3 above.
- 2.1.5 Owner Parties.** Defined in Exhibit A.
- 2.1.6 Project.** Defined in Section 1.1 above and Exhibit A.
- 2.1.7 Self-Work.** Any of the types of Work described on Exhibit D and any other part of the Work as to which Owner consents in writing to performance by Contractor as Self-Work (which consent shall not unreasonably be withheld) to the extent that such work is actually directly performed by Contractor and is not performed through a Subcontractor.

Article 3. PROGRESS PAYMENTS

- 3.1 Applications for Payment.** In addition to the documents and information required by the General Conditions of the Contract, Contractor's Applications for Payment shall include a statement in form approved by Owner setting forth (A) the percentage of the Work completed and the materials stored on the Site for the period ending the last day of the month for which the Progress Payment is requested for each category of the Schedule of Values, (B) the amount previously invoiced under the Contract, (C) the amount previously retained, (D) the net amount to be paid on the current Progress Payment (less applicable Retainage), and (E) the amount of the Contract Sum remaining unpaid if the requested payment is made in full.
- 3.2 Amount of Progress Payments.** The net amount to be paid based on an Application for Payment shall be (a) the total of the amounts obtained by applying the percentage of completion for each line item in the Application for Payment to the price for that item in the Schedule of Values, less (b) the total amount of previous Applications for Payment.

Article 4. MISCELLANEOUS

- 4.1 Claims for Damages.** Should either party suffer injury or damage to persons or property because of any act or omission of the other party or of any of its employees, agents, or others for whose acts it is legally liable, a claim shall be made in writing to such other party, with a copy to the Architect, within the time period required by the express terms of this Agreement and the

General Conditions of the Contract, or if not specified in this Agreement or the General Conditions of the Contract, within a reasonable time after such injury or damage.

- 4.2 Assignment; Successors and Assigns.** Neither party to the Contract shall assign it or subcontract it as a whole without the written consent of the other. The Contractor shall not assign its interest in any amounts due or to become due to it under the Contract without the written consent of the Owner. Subject to the foregoing provisions of this Section, the Contract shall be binding upon and inure to the benefit of the parties hereto and their respective successors and assigns.
- 4.3 Entire Agreement.** This Agreement, the General Conditions of the Contract, any other Contract Documents, and all exhibits thereto constitute the entire agreement between the parties with respect to the Project and all prior proposals are hereby terminated.

[The remainder of this page is intentionally blank.]

Signature page to Construction Agreement:

Executed to be effective as of the date first written above.

[Signature block for corporation as contractor:]

(CORPORATE SEAL)

Contractor:

[Fill in full legal name of entity,] a Colorado corporation [if the entity was formed in another state, identify that state instead]

ATTEST:

By: _____ Date: _____
Print Name: _____
Title: _____

By: _____ Date: _____
Print Name: _____
Title: _____

[Signature block for other entity:]

Contractor::

[Fill in full legal name of entity,] a Colorado [state type of entity: limited liability company, limited liability partnership, etc.] [if the entity was formed in another state, identify that state instead]

By: _____ Date: _____
Print Name: _____
Title: _____

[Owner signatures appear on the following page]

Signature page to Construction Agreement:

APPROVED AS TO FORM IN BEHALF OF
SCHOOL DISTRICT NO. 1:

_____ Date: _____
James T. Allen
Interim Senior Director of Facilities

_____ Date: _____
Office of the General Counsel

_____ Date: _____
Trena Deane
Executive Director, Facility Management

_____ Date: _____
David Suppes
Chief Operating Officer

(S E A L)

**SCHOOL DISTRICT NO. 1
IN THE CITY AND COUNTY OF DENVER
AND STATE OF COLORADO**

ATTEST:

_____ Date: _____
Print Name: _____
Secretary, Board of Education

By: _____ Date: _____
Print Name: _____
President, Board of Education

TABLE OF EXHIBITS

- A. Project Information and Certain Key Terms
- B. Expenses Included in Cost of Work
 - B-1. Method of Payment Matrix
- C. Schedule of Exclusions
- D. Schedule of Permitted Self-Work
- E. Arbitration Process
- F. Equal Opportunity Construction Contracting Procedures
- G. Schedule Requirements
- H. General Conditions of the Contract
- I. Supplementary General Conditions of the Contract (if any)
- J. Federal Funding Provisions (if applicable)
 - J-1. Wage Determination (if applicable)

CONSTRUCTION AGREEMENT

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EXHIBIT A – PROJECT INFORMATION AND CERTAIN KEY TERMS

Project Name: _____ Project No. _____

Contractor: _____

1. GENERAL DESCRIPTION OF PROJECT:

[Insert a narrative description of the scope of the project. If there is a separate written document that describes the scope of the project, a cross-reference may be included here so long as it is unambiguous (include document dates, authors, etc.) and the document should be attached if practicable or clearly identified as a Contract Document.]

2. MILESTONE SCHEDULE

BOE Approval of Construction Contract:

Building Permit Granted:

Required Substantial Completion Date:

Required Final Completion Date:

3. PROJECT TEAM

The key members of the Project Team provided by Contractor include:

Contractor's Project Manager: _____

[Add others, if there will be more.]

4. ADDITIONAL LIABILITY INSURANCE COVERAGE REQUIREMENTS

Umbrella or Excess Following Form Insurance: \$3,000,000 per occurrence and in the aggregate. (See Section 12.1.7 of the General Conditions of the Contract.)

Pollution Liability Insurance: Not required initially (Owner may later require as provided in Section 12.4 of the General Conditions of the Contract).
 Minimum limits of \$ _____ per occurrence and in the aggregate (see Section 12.4 of the General Conditions of the Contract).

5. LIQUIDATED DAMAGES FOR DELAY

5.1 The liquidated damages amount to be applied under Section 3.5 of the General Conditions of the Contract for delays in Substantial Completion is \$ _____ .00 per day.

5.2 The liquidated damages amount to be applied under Section 3.5 of the General Conditions of the Contract for delays in Final Completion is \$ _____ .00 per day.

6. FEDERAL FUNDING

If this box is checked, Owner expects to pay for the Project using funds from United States government sources, and Section 4.17 of the General Conditions of the Contract, the provisions of Exhibit J, and the wage determination attached as Exhibit J-1 shall apply to the Project.

7. COP REQUIREMENTS

If this box is checked, then (i) Owner Parties shall include, in addition to the parties otherwise identified in this Agreement, Denver Public Schools Leasing Corporation and J.P. Morgan Trust Company, National Association, (ii) Contractor acknowledges that Owner under this Agreement is the tenant of the Project site and Denver Public Schools Leasing Corporation is the owner, and (iii) unless Owner and Contractor otherwise agree in writing, Owner shall be responsible to obtain from the property owner all consents and approvals required under the lease of the Site with respect to the Project.

8. TESTING

Contractor shall with due diligence study and evaluate all testing reports furnished by Owner, Architect, or their consultants, and any reports obtained by Contractor. Contractor shall advise Owner and Architect of any impact of such reports on the construction and contemplated utilization of the Project. Contractor shall not be held responsible for the accuracy of Owner-furnished information, provided that Contractor shall notify Owner of any inaccuracy or incompleteness in information furnished by the Owner that is apparent in the exercise of reasonable professionally diligent review.

9. AS-BUILTS, MANUALS

At Substantial Completion, Contractor shall deliver to Architect one (1) complete set of As-Builts and all required documents and manuals under Section 4.10 of the General Conditions of the Contract.

10. NOTICE ADDRESSES OF THE PARTIES

Address for notices to Owner:

[with a copy to:]

Address for notices to Contractor:

DRAFT

EXHIBIT B – COST OF WORK

The Contract Sum is a stipulated sum and does not vary according to the Cost of Work.

There is no Exhibit B-1.

DRAFT

EXHIBIT C – SCHEDULE OF EXCLUSIONS

The following items are excluded from the scope of the Work:

1. Architectural services.
2. **[List others.]**

DRAFT

EXHIBIT D – SCHEDULE OF PERMITTED SELF-WORK

[None]

EXHIBIT E – DISPUTE RESOLUTION

Disputes, concerning the interpretation of, the meaning of the construction documents or the performance of any work under this Agreement between Contractor and Owner (the “**Parties**”), which cannot be resolved by designated representatives of the parties shall be subject to the provisions and procedures of the Dispute Resolution hereof. Except as otherwise provided herein, with respect to any Dispute that may arise under this Agreement, it shall be a condition precedent of the Parties to stay any legal action and before pursuing any litigation in a court of competent jurisdiction, for the Parties to work, in good faith, to resolve all Disputes, including any legal claims, that may arising out of any Dispute under this Agreement and agree to follow the Dispute Resolution process and procedures up to and until a final decision rendered.

All Disputes shall be conducted in accordance with the following provisions unless Owner and Contractor agree, in writing, that no Dispute which has not then already been submitted to Dispute Resolution, shall be subject to Dispute Resolution hereunder if one hundred eighty (180) days or more have passed since the Final Completion of the Project and one of the Parties has instituted litigation with respect to such Dispute before the time that Dispute Resolution of such Dispute has been demanded in accordance herewith. Capitalized terms not otherwise defined in this Exhibit shall have the same meanings assigned to them in the Agreement.

1. **Good Faith Resolution.** Any Dispute will initially be resolved informally. The Parties shall attempt in good faith to resolve promptly any Dispute by negotiation between representatives who have authority to settle the dispute (“Authorized Representatives”). The Authorized Representatives must not be any person with direct responsibility for administration of this Agreement.
2. **Executive Director.** Any Dispute that is not resolved under Section 1 of this Exhibit E, shall be referred to the Executive Director of Facilities (the Executive Director”) who will render a final determination.
3. **Notice of Demand for Dispute Resolution.** In order to initiate Dispute Resolution, the Party demanding Dispute Resolution shall give the other Party telephonic notice of the demand and shall give written notice demanding Dispute Resolution to such Parties. Such written notice shall identify the issues in dispute. Any time periods based on the date of notice of the demand for Dispute Resolution shall be measured from the date such written notice is given in accordance with Article 16 of the Agreement.
4. **Time and Place for Meeting.** Upon written request from either Party to the Executive Director, the Executive Director shall schedule a meeting (the “**Meeting**”) at the Executive Director’s office within three (3) days of receipt of the request. Owner and Contractor shall both attend the Meeting with the Executive Director and each Party shall be represented as it determines to be appropriate. At or before the Meeting, either Party may, at its option, submit a short written statement describing the matter in dispute and its position in regard to the same. At the Meeting, the Parties shall show the Executive Director the parts of the Work or the drawings, or plans and specifications in dispute and each Party shall make such presentation of its case at the Meeting as its shall determine. The Meeting shall continue (including from day to day if required) until all presentations permitted by the Executive Director have been completed. Unless agreed to at the Meeting by the Executive Director, neither Party shall be entitled to make any submission after the Meeting as to any matter discussed at the Meeting.
5. **Executive Director’s Decision.** The Executive Director shall deliver a decision as to each issue discussed at a Meeting to the Parties promptly and, in any event, within five (5) business days following the conclusion of the Meeting as to any Dispute discussed at a Meeting. Each decision shall be rendered in a reasoned writing explaining the basis therefor in sufficient detail for a third party to understand the basis for the decision (the “**Decision**”). The Executive Director’s decision is final.

EXHIBIT F – EQUAL OPPORTUNITY CONSTRUCTION CONTRACTING PROCEDURES

1 OWNER’S POLICY

- a) The policy of the Denver Public Schools with respect to equal opportunity contracting was established by Board of Education Resolution 2621. That policy commits the Owner to the creation and preservation of equal opportunities for all people to participate in the delivery of goods and services through the contracting processes of the Denver Public Schools without regard to gender, race, ethnicity, religion, age, or disability. It is the express expectation of the Board of Education that those who contract with the Owner shall in turn make available equal opportunities to the extent third parties are engaged to provide goods and services to the Owner as subcontractors, vendors, or otherwise.
- b) Pursuant to resolution 2621, the contracting policies and practices of the Owner are to conform to the following parameters:
- c) No person shall be excluded from participation in, denied the benefits of, or otherwise discriminated against in connection with the award and performance of any contract on the grounds of gender, race, ethnicity, religion, age, or disability.
- d) Neither the gender, race, ethnicity, religion, age, nor disability of any contractor or subcontractor shall be a factor in the evaluation of any proposal or award of any contract.
- e) Any party contracting with the Owner for the provision of goods or services shall be required to agree as a condition of the contract not to discriminate on any of the foregoing grounds in the performance of the contract.
- f) Information regarding contracting opportunities with the Owner shall be disseminated in a manner calculated to reach all persons qualified to provide pertinent goods and services.
- g) The criteria used in evaluating contract proposals shall be based on the Owner’s interest in securing cost effective, quality goods and services and shall not exclude or disadvantage parties for reasons that are not closely related to those interests.
- h) In determining contract requirements care shall be taken to encourage submission of quotes or proposals from as wide a base of potential vendors as is reasonably possible.
- i) Owner contracts for the provision of goods or services shall require that the contracting parties disseminate information regarding any third party contracting opportunities in a manner reasonably calculated to reach all persons qualified and willing to participate.
- j) Owner contracts for the provision of goods or services shall require that the contracting party retain and make available to the Owner records regarding dissemination of information regarding third party contracting opportunities, including responses received by the contracting party.

2 DISSEMINATION OF INFORMATION

- a) Pursuant to Resolution 2621 contracting opportunities and processes shall be disseminated as follows:

(1) Dissemination of Information by the Owner

(a) The Owner shall disseminate information regarding construction contracting opportunities by placing advertisements in a local newspaper of general circulation to all potentially interested contractors and subcontractors in the community. In addition, the Owner shall make plans available for construction projects in its Construction Services Office, in the offices of the project architect, and at suitable locations within the community where those plans may be reviewed by interested contractors and subcontractors free of charge.

(2) Dissemination of Information by Contractors

(a) Each contractor shall place advertisements inviting bids or proposals on all work not to be performed by the contractor itself. At minimum, such advertisements shall be placed in a newspaper or trade journal of general circulation within the Denver metropolitan area for at least one (1) day. Such advertising may be excused only with written permission of the Owner's Construction Services office, under circumstances where such advertisement would be impractical or would not reasonably further the equal opportunity contracting policy of the Owner. A contractor participating in more than one project may consolidate its advertisements to save costs.

3 DATA COLLECTION AND REPORTING

a) Pursuant to Resolution 2621 the Owner's Purchasing Department is responsible for collecting and maintaining information necessary to permit the Owner to determine the effectiveness of Owner contracting policies and practices in ensuring equal opportunity. Such information will be collected, maintained, and reported as follows:

(1) Subcontractor Bidding Phase

(a) Each Contractor shall promptly provide to the Owner's Purchasing Director copies of advertisements placed pursuant to these procedures.

(b) The Contractor shall provide to the Owner's Purchasing and Manager of the Business Diversity Outreach Program a completed Subcontractor Participation Report when the Contractor has collected the bids from which it intends to select Subcontractors. A form of this report is available from the Owner. The Contractor shall provide data on all subcontractors contacted during the bid period and on each bid received from all subcontractors. Such list shall identify which, if any, of the firms on the list are, to the best of the Contractor's information, certified diverse businesses ("Certified Diverse Businesses"). Certified Diverse Business firms are defined for purposes of this procedure as businesses owned or controlled by Native Americans, Asian Americans, African Americans, Hispanics, or women. A business is deemed owned by whoever holds at least 51% of the equity interest in the enterprise. A business is deemed controlled by its chief executive officer (if the business is a corporation), its managing partner (if business is a partnership), the proprietor (if the business is a sole proprietorship), and in all cases by the person or persons with ultimate decision-making authority in the ongoing, day-to-day operation of the business. For a diverse business to become a Certified Diverse Business, the diverse business must obtain certification from a governmental agency, an industry recognized third party certification organization or the Owner may recognize the diverse business as "certified".

(c) The information required by the preceding paragraph shall promptly be supplemented each time a subcontractor is replaced or an additional subcontractor is retained.

(d) To facilitate identification of Certified Diverse Businesses, the Owner will place on its Website the "Denver Public Schools Diverse Business Directory". Contractors may also utilize the websites of the City & County of Denver, www.denvergov.org, Rocky Mountain Minority Supplier Development Council, www.rmmsdc.org, U.S. Small Business Administration, www.sba.gov, State of Colorado/DBE Certification, www.dot.state.co.us/eeo/certification, and Regional Transportation District, www.rtd-denver.com.

(e) The Owner's Purchasing Department shall verify and compile all data received from contractors regarding Certified Diverse Business usage and shall report such data to the Board of Education. Each report shall set forth:

- (i) The identity of each Certified Diverse Business firm
- (ii) The type of work done by each Certified Diverse Business firm
- (iii) The dollar amount of the contracts with such firms
- (iv) The dollar amount of Certified Diverse Business participation on each specific project
- (v) The dollar amount of Certified Diverse Business participation on all projects in total during any reporting period
- (vi) The percentage of the dollar volume of Certified Diverse Business participation in each project
- (vii) The percentage of the dollar volume of Certified Diverse Business participation on all projects in total

4 RECORDS RETENTION AND INSPECTION

a) Each contractor shall retain and make available to the Owner and its designees records sufficient to permit the Owner to ascertain compliance with the equal opportunity contracting requirements. The following records shall be maintained and made available for inspection by the Owner and its designees:

- (1) All records reflecting any invitations to submit bids or proposals regarding subcontracting opportunities on any Owner project, including, but not limited to:
- (2) Copies of advertisements placed by the contractor in any newspaper or trade journal
- (3) Copies of requests for proposals or bid solicitations sent to any potential subcontractors, including names and addresses of each person or entity to whom such solicitations or proposals were sent
- (4) Logs showing persons contacted by telephone or in person regarding bid opportunities

(5) All responses received to invitations to bid on subcontracting opportunities, including written responses and notes, memoranda, or other records of oral responses.

(6) All correspondence accepting, rejecting, qualifying, revising, or otherwise related to any invitation to bid subcontracting opportunities or responses thereto.

5 CONTRACT REQUIREMENTS

a) Pursuant to Resolution 2621 each Owner contract with any contractor shall contain the following provisions:

b) Denver Public Schools intends that the contracting processes of the Owner and its contractors provide equal opportunity without regard to gender, race, ethnicity, religion, age, or disability, and that its contractors make available equal opportunities to the extent third parties are engaged to provide goods and services to the Owner as subcontractors, vendors, or otherwise. Accordingly, the contractor shall not discriminate on any of the foregoing grounds in the performance of the contract and shall make available equal opportunities to the extent third parties are engaged to provide goods or services in connection with performance of the contract.

c) The contractor shall disseminate information regarding all subcontracting opportunities under this contract in a manner reasonably calculated to reach all qualified potential subcontractors who may be interested. The contractor shall maintain records demonstrating its compliance with this article and shall make such records available to the Owner upon the Owner's request.

d) In implementing the foregoing provisions the contractor shall comply with and be bound by the Owner's equal opportunity construction contracting procedures in all respects. Such procedures are hereby incorporated by reference and are made a material part of this contract, violation of which may be deemed grounds for termination of the contract by the Owner.

6 ENFORCEMENT

a) The Owner's equal employment opportunity construction contracting requirements shall be enforced under the direction of the Owner's Chief Operating Officer who shall cause to be implemented the following steps:

(1) Compliance Review

(a) Contractor compliance with the advertising and Certified Diverse Business identification requirements of these procedures shall be verified in each instance. In addition, contractor records shall be reviewed and the information contained in those records verified to such extent as the Chief Operating Officer deems appropriate to ensure compliance with these procedures.

(2) Complaints

(a) Any person who believes any person or firm has been subject to discrimination with respect to contracting opportunities, or that any contractor has failed to fulfill the requirements of these procedures, may file a complaint in writing with the Owner's Purchasing Director, who shall cause a prompt investigation to be undertaken regarding that complaint.

(3) Reasonable Cause Notice

(a) If an audit, review, or investigation results in a determination of reasonable cause to believe that a contractor is not in compliance with these procedures, the Purchasing Director shall cause notice be given to the contractor in person or by registered mail identifying the area of noncompliance and requiring the contractor to show cause why specified sanctions should not be imposed. The notice shall advise the contractor that he may review the evidence supporting such reasonable cause determination and that he may submit a written response to such determination and request a hearing before the Chief Operating Officer regarding such determination and any sanction to be imposed. The notice shall further set forth the sanction proposed for such noncompliance.

(4) Hearing

(a) If a contractor requests a hearing regarding a reasonable cause determination, the Chief Operating Officer, or his designee shall hold a hearing at which such information and argument relevant to the determination shall be presented. The hearing shall be informal and the rules of evidence shall not be applied.

(5) Decision

(a) Following receipt of the contractor's response to the reasonable cause notice, or following a hearing, if one is requested, the Chief Operating Officer, or his designee shall issue a decision making finding with respect to the contractor's compliance or noncompliance with these procedures and imposing such sanctions, if any, as are appropriate. Such decision shall be final and binding.

(6) Contractor's Cooperation

(a) Each contractor shall cooperate with the Owner in auditing, reviewing compliance, and investigating complaints. Such cooperation shall include maintaining and producing records required by these procedures and making available to the Owner personnel who have such information pertinent to these procedures. No contractor shall retaliate against any person or firm, or attempt to intimidate or coerce any person or firm for registering a complaint or cooperating with an investigation related to these procedures. Nor shall any contractor knowingly provide any false or inaccurate information in connection with any audit, review, or investigation.

(7) Sanctions

(a) Sanctions to be imposed for violations of these procedures may include one or more of the following:

(i) Forfeiture of opportunities to bid on Owner work for a specified time period or for specified projects

(ii) Disqualification from the Owner's list of approved contractors that are considered for district-wide projects, either permanently, or for a specified time period

(iii) Contract termination

(iv) Such other sanctions as may be deemed appropriate to effectuate the purposes of these procedures

EXHIBIT G – SCHEDULE REQUIREMENTS

1. **Electronic Data Format.** The Project Schedule shall be developed and maintained using MS Project, Suretrack or another electronic system approved in writing by Owner.
2. **General Requirements.**
 - 2.1 The Project Schedule shall include realistic activity sequences and durations, allocation of labor and materials, processing of shop drawings and samples, normal weather delays in accordance with Section 3.4.2 of the General Condition of the Contract and allowances for lead times in delivery of products. The Project Schedule shall provide for coordination with any separate construction activities by Owner that relate to or affect the Project (including any abatement, moving, or other occupancy requirements) and shall indicate the occupancy priority for different portions of the Site.
 - 2.2 The Project Schedule shall be divided into logical building areas by floor levels, elevations, functional spaces and additions or renovations.
3. **Submissions.**
 - 3.1 Contractor shall submit an updated Project Schedule with each Application for Payment. Each update shall include a time-scaled summary chart and a narrative report containing a description of the current status of the progress of the Work, current and anticipated delaying factors and their estimated impact on performance of other activities and completion dates, and an explanation of corrective actions taken or proposed to address any delaying factors. Such monthly submittal shall include a time-scaled Gantt chart and mathematical analysis in Portable Document Format (.pdf) and an electronic copy of the MS Project or Suretrack file that can be accessed to review all task relationships and all attached constraints.
 - 3.2 Whenever the current update to the Project Schedule reflects a delay of five (5) or more working days behind schedule, Contractor shall submit, together with the Project Schedule update, a written statement describing the cause of the delay and the actions being taken or considered by the Contractor to recover the time lost.
 - 3.3 Proposed changes to the Project Schedule shall be submitted to Owner's Project Manager for review. Submissions of the Project Schedule proposing changes shall clearly identify the activities and/or logic affected by the proposed changes and compare such changes to the most recently accepted Project Schedule.
4. **Detail Requirements.** The Project Schedule shall, at a minimum, include the following detail and account for the following factors:
 - 4.1 Activity durations in working days.
 - 4.2 Long lead time procurement activities.
 - 4.3 Contractor phasing activities.
 - 4.4 Milestone dates for phasing requirements.
 - 4.5 Owner activities (e.g. delivery of Owner-furnished items)
 - 4.6 Resource constraints.

- 4.7 Interfaces with work by others (e.g. utility connections)
- 4.8 Concurrent activities by Owner's separate contractors, to the extent they may interface with or otherwise affect the Work.
- 4.9 Inspection, commissioning and testing activities.
- 4.10 Clean-up and punchlist activities.
- 4.11 Owner move-in activities.
- 4.12 Weather constraints.
- 4.13 Change Directives and Agreed Changes.
- 4.14 Start, early start, late start, actual start, % complete, finish, early finish, late finish, remaining duration, actual finish, and total float for each activity.

5. Drawing and Analysis Details.

- 5.1 The CPM logic drawings included in the Construction Schedule shall be 30" x 42" and shall, at a minimum, include:
 - 5.1.1 Activity descriptions.
 - 5.1.2 Activity durations.
 - 5.1.3 Marked critical path.
 - 5.1.4 Marked complete activities.
 - 5.1.5 Highlighted milestone dates.
 - 5.1.6 The update number and date for the logic drawing.
- 5.2 The CPM computer analysis included in the Construction Schedule shall, at a minimum, include:
 - 5.2.1 The activity designation.
 - 5.2.2 The activity description.
 - 5.2.3 The activity duration (in working days), early start, late start, early finish, and late finish dates, % complete, remaining duration, and total float.
 - 5.2.4 Subcontract or trade designation.

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EXHIBIT H – GENERAL CONDITIONS OF THE CONTRACT

(See Separate Attachment)

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EXHIBIT I – SUPPLEMENTARY GENERAL CONDITIONS OF THE CONTRACT

(none)

**School District No. 1 in the City and County of
Denver and State of Colorado**

General Conditions of the Contract

Article 1. DEFINITIONS AND INTERPRETATION

1.1 Definitions.

- 1.1.1 **Terms Defined in Other Contract Documents.** Terms defined in the Agreement or other Contract Documents and not defined herein shall have the meanings given them in the Contract Documents where they are defined.
- 1.1.2 **Agreed Change.** Defined in Section 5.1.2 below.
- 1.1.3 **Agreement.** The Agreement to which these General Conditions of the Contract are attached.
- 1.1.4 **AHJ.** The governmental authority having jurisdiction over the Project selected by Owner for building permits, inspections and approvals.
- 1.1.5 **Application for Payment.** Defined in Section 2.2.1.
- 1.1.6 **Dispute Resolution.** An Owner administrative proceeding pursuant to the provisions of Exhibit E to the Agreement.
- 1.1.7 **Dispute.** A dispute subject to Dispute Resolution.
- 1.1.8 **Architect.** The architect, engineer, or other design consultant engaged by Owner in connection with the Project. If the Owner has not engaged such a person, references to the Architect shall be deemed to refer to the Owner unless otherwise expressly provided.
- 1.1.9 **As-Builts.** Defined in Section 2.5.1.4 below.
- 1.1.10 **Change Directive.** Defined in Section 5.1.1 below.
- 1.1.11 **Change Order.** Defined in Section 5.6 below.
- 1.1.12 **CMGC Agreement.** If these General Conditions of the Contract are used with a Construction Manager / General Contractor Agreement, that agreement.
- 1.1.13 **Colorado Labor.** "Colorado Labor" means any person who is a resident of the State of Colorado at the time of employment, selected without discrimination as to race, color, creed, sex, age, or religion, except when sex or age is a bona fide occupational qualification; provided that if C.R.S. § 8-17-101 is revised to provide a different definition of the term "Colorado Labor," such term shall have the meaning provided in C.R.S. § 8-17-101.
- 1.1.14 **Commencement of Construction.** Defined in Section 14.7 for the purposes of that Section only.

- 1.1.15 **Construction Documents.** The part of the Contract Documents comprised of the plans, specifications and other documents prepared by Architect, subject to Owner's approval, to be used in the execution of the Work.
- 1.1.16 **Construction Fee.** If the Agreement is a CMGC Agreement, the term "Construction Fee" is defined in the Agreement. Otherwise, references in these General Conditions of the Contract to the "Construction Fee" shall mean the Contractor Fee.
- 1.1.17 **Construction Work.** The portion of the Work comprised of the physical construction of the Project, including supervision and administration thereof.
- 1.1.18 **Contract.** The agreement between Owner and Contractor relating to the Project contained in the Contract Documents.
- 1.1.19 **Contract Documents.** The Contract Documents identified in the Agreement.
- 1.1.20 **Contractor.** Defined in the Agreement. Where Contract Documents refer to a "Mechanical Contractor," "Electrical Contractor," or other specific contractors, those references mean "Contractor" when the work to be performed is part of the scope of Contractor's Work.
- 1.1.21 **Contractor Fee.** If the Agreement is a CMGC Agreement, the term "Contractor Fee" is defined in the Agreement. Otherwise, the term "Contractor Fee" shall mean the part of the Contract Sum allocated in the Schedule of Values to Contractor's profit, administrative and overhead expenses.
- 1.1.22 **Contract Sum.** Defined in the Agreement. If the Agreement is a CMGC Agreement, then adjustments in the Contract Sum to be made under these General Conditions of the Contract shall be applied to the Guaranteed Maximum Price, and prohibitions on adjustments to the Contract Sum contained in these General Conditions of the Contract shall be construed as prohibitions on adjustments to the Guaranteed Maximum Price.
- 1.1.23 **Cost of Work.** The sum of Direct Hard Costs, Soft Costs, and (if the Agreement provides for one) the General Conditions Fee, unless a different definition is provided in the Agreement.
- 1.1.24 **CPM.** The Critical Path Method of construction scheduling, as described in *CPM in Construction – A Manual for General Contractors*, published by The Associated General Contractors of America, Inc.
- 1.1.25 **Current Laws.** The applicable laws and regulations in effect from time to time on and after the date of this Agreement, including building codes, dimensional aspects of zoning regulations, safety regulations, environmental laws, and other laws and regulations applicable to the Project, as the same have been officially interpreted by published decisions of courts, published regulations, and other official published interpretations which have the force of law.
- 1.1.26 **Direct Hard Costs.** The costs of labor and materials for the physical construction of the improvements comprising the Work, including any site and infrastructure work, overlot grading, asphalt paving of parking areas and entry drive, surfacing of entries and loading dock, curb and gutter, sidewalks, site lighting, water and sanitary sewer piping and manholes, telephone conduit, landscaping, irrigation systems, storm sewers, retaining and detention ponds, site amenities, and fiber-optic conduit, manholes, electricity service lines, excavation and placement of foundation systems, concrete slab-on-grade,

structural frame and facades, window systems, roof-top mechanical enclosures, mechanical, plumbing and electrical systems, interior framing and finishes, and other similar elements.

- 1.1.27 **Employee Benefits.** Defined in Section 22.2.
- 1.1.28 **Event of Default.** Defined in Section 14.1.
- 1.1.29 **Excused Delay.** Defined in Section 3.4.
- 1.1.30 **Final Completion.** Defined in Section 3.3. “Finally Complete” and “Finally Completed” shall have the correlative meanings.
- 1.1.31 **Final Payment.** Defined in Section 2.5.1.
- 1.1.32 **Force Majeure Delay.** Defined in Section 3.4.3.1.
- 1.1.33 **General Conditions Fee.** May be defined in the Agreement.
- 1.1.34 **General Conditions of the Contract.** These General Conditions of the Contract, including without limitation any and all Supplementary General Conditions of the Contract and Addenda to General Conditions of the Contract.
- 1.1.35 **Hazardous Substances.** Defined in Section 16.1.
- 1.1.36 **Interim Schedule.** Defined in Section 4.2.1.
- 1.1.37 **Lost Weather Day.** Defined in Section 3.4.2.2.
- 1.1.38 **Milestone Schedule.** The schedule for the design and construction (if construction is contemplated) of the Project set forth in Exhibit A to the Agreement.
- 1.1.39 **Ordinary Course Materials.** Defined in Section 16.5.
- 1.1.40 **Owner.** School District No. 1 in the City and County of Denver and State of Colorado.
- 1.1.41 **Owner Delay.** Defined in Section 3.4.1.
- 1.1.42 **Owner Parties.** Owner, its directors, officers, agents and employees, the members of its Board of Education, and such other parties as may be designated as Owner Parties in Exhibit A to the Agreement.
- 1.1.43 **Owner’s Project Manager.** The individual employee or agent of Owner designated by Owner from time to time as Owner’s primary representative in connection with the Project.
- 1.1.44 **Owner’s Website.** Owner’s Internet World Wide Web page at <http://fm.dpsk12.org/> and its subsidiary pages.
- 1.1.45 **Progress Payment.** Defined in Section 2.2.
- 1.1.46 **Project Schedule.** Defined in Section 4.2.2.

- 1.1.47 **Proposed Change.** Defined in Section 5.2.1 below.
- 1.1.48 **Punch List.** A punch list prepared by Contractor, Architect and Owner at the time of Substantial Completion, further described in Section 3.2 below, listing items of Work to be completed in order to bring the Work to Final Completion.
- 1.1.49 **Required Substantial Completion Date.** The date specified as the Required Substantial Completion Date in the Milestone Schedule.
- 1.1.50 **Required Final Completion Date.** The date specified as the Required Final Completion Date in the Milestone Schedule.
- 1.1.51 **Retainage.** Defined in Section 2.2.2.
- 1.1.52 **Schedule of Values.** Defined in Section 2.1.
- 1.1.53 **Site.** The property of Owner where the Project is to be constructed (or a portion of such property reasonably designated by Owner), whether one or more parcels.
- 1.1.54 **Soft Costs.** Amounts payable by Contractor to third parties for development approvals and building permits, costs of insurance and bonds (unless Exhibit B-1 to the Agreement allocates such costs to a different category), consulting fees, and other fees, taxes, and assessments related to the Work and payable to governmental authorities for which Contractor is liable
- 1.1.55 **Standards.** Denver Public Schools Design and Construction Standards, a copy of which is available on Owner's Website.
- 1.1.56 **Subcontractor.** Any contractor who has contracted directly with Contractor for the performance of part of the Work.
- 1.1.57 **Substantial Completion.** Defined in Section 3.2. "Substantially Complete" and "Substantially Completed" shall have the correlative meanings.
- 1.1.58 **Sub-subcontractor.** Any contractor who has not contracted directly with Contractor but has contracted directly with or indirectly with a Subcontractor for the performance of part of the Work.
- 1.1.59 **Supplier.** Any materialman, or supplier of materials or equipment who has contracted directly or indirectly with Contractor to provide materials and supplies for the Work.
- 1.1.60 **Warranty Period.** Defined in Section 11.1.
- 1.1.61 **Weather Delay.** Defined in Section 3.4.2.
- 1.1.62 **Work.** All construction, construction management, supervision, coordination and other tasks contemplated by or reasonably inferable from the Contract Documents. If the Agreement is a CMGC Agreement, the term "Work" also includes the Pre-Construction Work.
- 1.1.63 **Work Product.** All documents, materials, and things, including plans and other drawings, specifications, reports, assessments and models, created or prepared by Architect or Contractor.

1.2 Interpretation.

- 1.2.1 “Including” shall, unless otherwise specifically stated, mean including, but not limited to.
- 1.2.2 Words such as “hereby,” “herein,” and “hereunder” and words of similar import shall be construed to refer to the Agreement in its entirety and the General Conditions of the Contract, subject to the provisions of the Agreement relating to resolution of differences between terms of different Contract Documents.
- 1.2.3 Where otherwise consistent with the context, the singular shall include the plural and the plural shall include the singular.
- 1.2.4 The titles of articles and sections used in the Agreement and these General Conditions of the Contract are primarily for the convenience of the reader but may be used as aids in interpreting any provision herein. If any of the provisions of the exhibits attached to the Agreement hereto or of any of the Contract Documents are inconsistent with the provisions of the Agreement, the provisions of the Agreement shall control.
- 1.2.5 Any references to “days” in any Contract Documents refer to calendar days. Any references in any Contract Documents or any communications between Owner and Contractor to “business days” refer to days when Owner’s administrative offices are open for the regular conduct of business. Any such references to the “school year” refer to the period from August to late May or early June when Owner’s school facilities are in regular session, as determined by the official calendar of Denver Public Schools. Any such references to “summer” refer to the period between the end of one school year in late May or early June and the commencement of the next school year in August.
- 1.2.6 Wherever the Contract Documents contain the words “as directed,” “as required,” “as ordered,” “as designated,” “as indicated,” “as prescribed,” or other words or phrases of like import to refer to elements of the Work, the same shall be construed to refer to the direction, requirement, order, designation, indication, prescription, or other approval of the Architect and Owner, unless otherwise expressly stated. When the words “as approved,” “as accepted” (or “acceptable”), “satisfactory,” or other words or phrases of like import are used to refer to elements of the Work, they shall mean approved or accepted by, or acceptable to, or satisfactory to the Architect and Owner, unless otherwise expressly stated.

Article 2. PAYMENTS

- 2.1 Schedule of Values.** Before beginning Construction Work or at such earlier time as may be required by the Agreement, Contractor shall submit a schedule showing the breakdown of the total cost of the Project into itemized categories for the various parts of the Work, separating material costs, labor costs, general conditions costs and other costs, including as material costs the material costs of all Subcontractors and the costs of all materials to be taken from the Contractor’s or any Subcontractor’s own stocks of material, all in form acceptable to the Owner, and supported by such evidence as the Architect or Owner may request. Such schedule shall be subject to approval by Owner, which approval shall not unreasonably be withheld. If Owner does not approve such schedule, it shall specify the portions thereof that it does not approve and give reasons why Owner is withholding approval, and Contractor shall revise the schedule. Such schedule, or any revision thereof, when approved by Owner is called the “**Schedule of Values.**”
- 2.2 Progress Payments.** Owner shall make monthly payments (each a “**Progress Payment**”) on account of the Contract as follows:

2.2.1 Application for Payment.

2.2.1.1 Before Work commences, Owner shall designate a day of the month by which Applications for Payment shall be due. On or before such day of each month after the Construction Work has commenced (but not earlier than the first day of such month), Contractor shall submit to Owner and Architect an “**Application for Payment**” substantially in the form of the current AIA Documents G702 and G703 (the Application and Certificate for Payment and the Continuation Sheet) based on the Schedule of Values, and such other materials and information as may be required by the Agreement. No Application for Payment except the Application for Final Payment shall be made for an amount less than \$1,000.00.

2.2.1.2 Each Application for Payment shall constitute a representation and warranty of Contractor (whether or not specifically stated) that Contractor is not in default hereunder, the amounts requested in the Application for Payment are due hereunder, after payment of the amounts requested in the Application for Payment, the amount remaining to be paid under the Contract is sufficient to pay for the balance of the Work, the Work performed to date is in accordance with that contemplated by the Milestone Schedule (or specifying the portions thereof that are not), Contractor has no claims hereunder and has no request for changes in the Milestone Schedule or the Contract Sum not provided for in the Application for Payment. Each Application for Payment shall further constitute the representation and warranty of Contractor (whether or not specifically stated) that the percentage of the Work represented to have been done in each category provided on the Schedule of Values has, in fact, been completed as of the last day of the period for which such Application for Payment has been submitted. The period covered by an Application for Payment shall end not earlier than ten (10) days before the due date for the Application for Payment, unless Contractor and Owner agree otherwise in writing.

2.2.1.3 Each Application for Payment shall set forth the status of all Proposed Changes, Change Directives, and Change Orders.

2.2.1.4 Contractor shall promptly submit such additional information and documents as Owner or Architect may reasonably request in support of the Application for Payment.

2.2.2 **Retainage.** Until the Work has been completed and all conditions to Final Payment have been satisfied, Owner shall be entitled to retain from each Progress Payment five percent (5%) of the amount that would otherwise be due to the Contractor (the “**Retainage**”).

2.2.3 **Warranty of Title to Work Completed.** Contractor warrants and guarantees that title to all work, materials, and equipment covered by an Application for Payment, whether incorporated in the Work or not, will pass to Owner upon the receipt of such payment by Contractor, free and clear of all liens, claims, security interests, or other encumbrances, including all claims of Subcontractors, Suppliers, and any others providing work or materials for the Project, or who might be entitled to make a claim based thereon. No work, materials, or equipment covered by an Application for Payment shall have been acquired subject to an agreement under which an interest therein or an encumbrance thereon is retained by the seller or otherwise imposed by Contractor or by other persons who perform any work at the Site or furnish any materials or equipment for the Work. Although title to all components and aspects of the Work which are in place and title to all materials on account of which any payment has been made to Contractor shall be granted to Owner in accordance with this Section, Contractor shall continue to provide for

adequate protection of all Work until Substantial Completion. Contractor shall make good any damage, injury, or loss to Work prior to Substantial Completion except to the extent such damage, injury, or loss is caused by Owner, its contractors, suppliers, agents, licensees, guests, or invitees.

- 2.2.4 Payment of Subcontractors and Suppliers.** Contractor shall promptly pay all amounts due to Subcontractors, Suppliers, and any others engaged by Contractor for the Work. Whether or not expressly stated, each Application for Payment to Owner will constitute a warranty and representation from Contractor to Owner that all Work previously paid for by Owner is free and clear of all liens, encumbrances and claims and that all Subcontractors, Suppliers, and others engaged by Contractor for such Work have been paid all amounts due to them on account of payments previously made by Owner to Contractor. Owner may, at its option, pay Subcontractors, Suppliers and other vendors directly or by checks issued to Contractor and such persons jointly.
- 2.2.5 Payments for Pre-Requisitioned Materials.** The costs of materials purchased and stored in accordance with all applicable provisions of the Contract Documents but not yet installed may be included in the applicable category of costs for an Application for Payment when stored, provided that such costs shall not be included again when the materials are installed, and Owner shall be entitled to a credit for the value of any such materials not actually incorporated in the Work. Payments to be made on account of such materials shall be conditioned upon submission of bills of sale or such other documents or procedures satisfactory to Owner to establish Owner's unencumbered title to such materials or equipment or otherwise to protect Owner's interest.
- 2.2.6 Right to Audit; Non-Waiver.** Payment of any Progress Payment by Owner shall not foreclose the right of Owner to examine the books and records of Contractor applicable to the Contract to determine the correctness and accuracy of any item and shall not constitute an acceptance by Owner of the Work covered thereby or a waiver of any claim or right which Owner may have with regard to such Work or the Application for Payment.
- 2.2.7 Certificate for Payment.**
- 2.2.7.1** The Architect shall, within ten (10) days after receipt of the Contractor's Application for Payment, either certify the same to Owner for payment (with a copy to the Contractor) or notify Contractor and Owner of the reasons for withholding certification, which the Architect may withhold in whole or in part if it determines in its professional judgment that it cannot make the representations required by this Section 2.2.7 with respect thereto or for other good cause (including any of the causes listed in Section 2.4 below except Section 2.4.1).
- 2.2.7.2** The issuance of a certificate for payment shall constitute a representation by the Architect to the Owner, to the best of the Architect's knowledge, information and belief based on the observation of the Work required by the Architect's agreement with the Owner, that the Work has progressed to the point indicated and that the quality of the Work is in accordance with the Contract Documents, subject to minor deviations to be corrected prior to completion and specific qualifications the Architect may set forth in its certificate. The issuance of such a certificate shall not be construed as a representation that the Architect has evaluated construction means, methods, techniques, sequences or procedures. Such a certificate for payment shall not be construed as a determination binding upon Owner of any of the matters described in this Section 2.2.7.2.

- 2.3 Time for Progress Payment.** Subject to the provisions of Section 2.4 below, Owner shall make Progress Payments based on Applications for Payment within thirty (30) days after the date each application is properly submitted; provided, however, that if an Application for Payment is submitted after the day of the month it is due, payment thereon shall be made within thirty (30) days after the due date of the next Application for Payment.
- 2.4 Owner's Ability to Withhold Payment.** Architect may decline to approve, or Owner may decline to make payment of, any portion of a Progress Payment that is not then payable in accordance herewith and may decline to make payment of any other portion of a Progress Payment which is reasonably necessary to protect Owner from any loss because of any of the following:
- 2.4.1 Architect's withholding of certification of the Progress Payment or the applicable portion thereof.
 - 2.4.2 Defective portions of the Work not corrected (for which an Application for Payment has been submitted).
 - 2.4.3 Damage by Contractor to property not included in the Work.
 - 2.4.4 Failure of Contractor to obtain necessary permits or licenses or to comply with Current Laws.
 - 2.4.5 Failure to submit required progress reports.
 - 2.4.6 Failure to keep a superintendent on the Site during Construction Work.
 - 2.4.7 Failure of Contractor to make payments properly to Subcontractors, Suppliers, and others for labor, materials, or equipment, the filing of claims for payment with respect to part of the Work, or a reasonable likelihood exists that a claim will be made.
 - 2.4.8 A reasonable likelihood exists that the Work cannot be completed for the unpaid balance of the Contract Sum.
 - 2.4.9 The Work cannot be Substantially Completed by the Required Substantial Completion Date, as extended, if applicable, pursuant to the terms of the Contract Documents, and the unpaid balance would not be adequate to cover the sum of (i) the unpaid balance of the Contract Sum plus (ii) liquidated damages or other damages for the anticipated delay.
 - 2.4.10 Failure of Contractor to carry out the Work in accordance with the Contract Documents.
 - 2.4.11 The Work has not reached the stage of completion claimed in the Application for Payment or, for any other reason, payment is not then due hereunder.
 - 2.4.12 Claims filed in connection with the Work or reasonable evidence indicating probable filing of claims.
 - 2.4.13 Amounts due and unpaid from Contractor to Owner under the Contract or any other agreement.
 - 2.4.14 Any other cause that reasonably justifies withholding payment either (i) to assure the full and timely performance by Contractor hereunder or (ii) to protect Owner from loss or damage hereunder.

- 2.4.15 If Owner withholds any portion of a Progress Payment, it shall be obligated to pay the undisputed balance of the Progress Payment, as set forth in the Application for Payment, less the amount reasonably estimated by Owner as necessary to protect Owner from the losses enumerated under this Section 2.4. No such withholding in good faith shall constitute an Event of Default by Owner or entitle Contractor to stop the Work.

2.5 Payment upon Final Completion.

- 2.5.1 Full payment of the Contract Sum, including all Retainage previously withheld (the “**Final Payment**”), shall be due and payable within sixty (60) days after (i) Final Completion has been achieved and the Contract has otherwise been fully performed by Contractor except for Contractor’s responsibility to correct defective or nonconforming Work not yet discovered as provided in Article 11, and to satisfy other requirements, if any, which necessarily survive Final Payment; (ii) Contractor has submitted to Owner and Architect Contractor’s Application for Final Payment; (iii) if required by the Agreement, a final accounting for the Cost of Work has been submitted by Contractor and reviewed by Owner and its consultants; (iv) any adjustments in the Final Payment required by such an accounting have been made; (v) Contractor has given Owner written notice that all of the documents and materials required by this Section 2.5.1 have all been delivered; and (vi) all of the following items have been provided to Owner and Architect or otherwise satisfied:
- 2.5.1.1 Contractor’s affidavit that all payrolls and bills for materials, equipment, and other indebtedness connected with the Work for which Owner has paid Contractor prior to the time of the Application for Payment have been paid or otherwise satisfied.
- 2.5.1.2 Consent of surety to Final Payment.
- 2.5.1.3 Reasonable evidence in the form of a “contractor certification” of material compliance with all requirements of the Contract Documents, together with (A) the operation and maintenance manuals required by Section 4.10; (B) keys for any newly keyed doors with a keying schedule (master, sub-master, and special keys); (C) certificates of all tests and inspections; (D) all existing printed or typewritten operating, servicing, maintenance, and cleaning instructions for all Work, including parts lists and special tools for mechanical and electrical Work; and (E) any similar materials reasonably requested by Owner.
- 2.5.1.4 A complete set of redline Construction Documents, including all plans and specifications, depicting and describing the condition of the Work as constructed (“**As-Builts**”), sufficient in the Architect’s judgment for the Architect to prepare final and complete as-built drawings and specifications for the Work.
- 2.5.1.5 A certificate (or, at Owner’s option, endorsements) evidencing that insurance required by the Contract Documents to remain in force, if any, is currently in effect and will not be canceled or allowed to expire without at least thirty (30) days prior notice to Owner.
- 2.5.1.6 A written statement that Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents.
- 2.5.1.7 Acceptance of the Final Payment by Contractor shall constitute a waiver of claims by Contractor except those previously made in writing and identified by Contractor as unsettled at the time of Application for Final Payment and except

for any disputed amounts that are pending any final cost accounting process required by the Agreement.

2.5.1.8 If, after Substantial Completion, the Final Completion of the Work is prevented through delay in the correction and completion of items on the Punch List by causes beyond the control of the Contractor, the Owner may, in its sole discretion, pay Contractor any of the amounts that would otherwise be due in Final Payment except that Owner shall retain an amount equal to three hundred percent (300%) of the cost of completing and correcting such incomplete or unacceptable Work, as reasonably estimated by Owner.

2.6 Final Settlement – Subcontractor and Supplier Claims

- 2.6.1 Before Final Payment is made, Owner will advertise the final settlement of the Contract by two (2) publications of notice thereof pursuant to C.R.S. § 38-26-107, the last of which shall be published not less than ten (10) days before the date set for final settlement. If any unpaid claim for labor, materials, rental machinery, tools, equipment, sustenance, or other supplies used or consumed in connection with the Work is filed, Owner shall withhold from the Final Payment amounts sufficient, in Owner's reasonable determination, to insure the payment of such claim until such claim shall have been paid or withdrawn, such payment or withdrawal to be evidenced by filing with the Owner a receipt in full or an order for withdrawal signed by the claimant or his duly authorized agent or assignee.
- 2.6.2 Notwithstanding the foregoing paragraph, funds retained for the payment of claims filed with the Owner shall not be withheld longer than ninety (90) days following the date fixed for final settlement as published unless an action is commenced within that time to enforce such unpaid claim and a notice of lis pendens is filed with the Owner.
- 2.6.3 At the expiration of the ninety-day period, Owner shall pay to the Contractor such amounts as are not the subject of suit and lis pendens notices and shall retain thereafter, subject to the final outcome of such suits, only sufficient funds to insure the payment of judgments that may result from the suit.
- 2.6.4 If any claim for such labor, materials, supplies or equipment remains unsatisfied after Final Payment, Contractor shall refund to Owner all sums which the Owner may for any reason be obligated to pay to satisfy such claim, including all costs and attorneys' fees incurred by Owner in connection therewith.

2.7 Appropriations.

- 2.7.1 If the Agreement is a CMGC Agreement, Owner states in accordance with C.R.S. § 24-91-103.6 that the amount of money appropriated by the Owner's Board of Education for the Work is equal to or in excess of the Guaranteed Maximum Price as it is established upon the execution of the Agreement, or, if no Guaranteed Maximum Price is established upon the execution of the Agreement, the Pre-Construction Fee.
- 2.7.2 If the Agreement is not a CMGC Agreement, Owner states in accordance with C.R.S. § 24-91-103.6 that the amount of money appropriated by the Owner's Board of Education for the Work is equal to or in excess of the Contract Sum.
- 2.7.3 No Change Order or other form of order or directive by Owner requiring additional compensable Work to be performed (including, if the Agreement is a CMGC Agreement, any approval of a First Cost Estimate or Second Cost Estimate that would newly

establish or increase the Guaranteed Maximum Price) shall be effective which causes the amount of compensation to exceed the amount appropriated for the Contract, unless (i) the Contractor is given written assurance by Owner that lawful appropriations to cover the costs of the additional Work have been made or (ii) the Work is performed pursuant to a clause that permits additional compensation in the event of a specific contingency or event.

- 2.7.4 Except to the extent specifically provided to the contrary by Current Laws, Owner's obligation for payments under the Contract shall extend only to money appropriated for that purpose as required of school districts by law.

2.8 Taxes; Direct Purchase Option.

- 2.8.1 Contractor shall only include sales and use tax levied by the City and County of Denver on materials from its Schedules of Values, and Subcontractors and Suppliers shall only include such amounts in their bids. Except as provided in Section 2.8.2 below, the Owner will furnish to Contractor, on request by the Contractor, the necessary exemption certificates to aid the Contractor in the recovery or avoidance of any such taxes paid or otherwise due to be paid by Contractor for materials and equipment built into the Project, or to support the Contractor's failure to pay such taxes, as the case may be.
- 2.8.2 Contractor and its Subcontractors shall be responsible to obtain from the Colorado State Department of Revenue certificates for exemption indicating that the purchase of construction building materials for the Work is for a purpose stated in Colorado Revised Statutes Section 39-26-114(1)(a)(XIX).
- 2.8.3 At Owner's option, Contractor and Owner shall cooperate with one another so that Owner may purchase or contract directly for such items or Contractor and Owner shall make other appropriate arrangements as necessary to avoid incurring taxes, fees, and other costs. In such circumstances, Contractor shall act as agent for Owner in effecting such purchasing and contracting, Contractor shall have all the responsibilities as to such portions of the Work as Contractor otherwise has with respect to the Work. Contractor shall be responsible to expedite, arrange for and receive delivery of all such purchases, regardless of whether made by Contractor or Owner, and shall promptly examine deliveries to ascertain whether or not they comply with the requirements of the Contract Documents. Contractor shall promptly notify the Owner and Architect of any delay in the delivery of such purchases, any failure to receive such purchases as needed and any failure of such purchases to comply with the Contract Documents
- 2.8.4 To the extent that Owner makes any payments directly to Suppliers, such payments shall be credited against the payments due from Owner to Contractor hereunder and shown, as incurred, on all Applications for Payment. Owner shall promptly notify Contractor and Architect, on serially numbered forms, of any amount paid directly for materials, any discounts obtained by Owner, and the amount of the credit due to Owner.
- 2.8.5 Contractor shall pay all sales, consumer, use, and other similar taxes required by law, all as part of the Contract Sum, except to the extent of the exemptions that may be available to Contractor or Owner as provided above. Contractor shall be entitled to an adjustment (increase) in the Contract Sum to the extent that an increase in the aggregate amount of such taxes payable by Contractor hereunder results from any change in Current Laws creating such taxes or increasing the rate of such taxes enacted after the date of the Agreement.

- 2.9 Discounts.** All discounts for prompt payment obtained by Contractor shall accrue to Owner to the extent they apply to Costs of Work payable by Owner (whether paid directly or reimbursed to Contractor). To the extent that such discounts apply to costs paid by Contractor without reimbursement, such discounts shall accrue to Contractor. All trade discounts, rebates and refunds, and all returns from sale of surplus or salvage materials and equipment, shall accrue to the benefit of Owner, and the Contractor's agreements with others shall provide for such credits to be applied either through credits from Subcontractors and Suppliers passed through to Owner by Contractor or by payment directly to Owner.
- 2.10 Adjustments.** The Contract Sum (or, if the Agreement is a CMGC Agreement, the Guaranteed Maximum Price) may be adjusted by Agreed Change. Contractor is obligated to pay out of its own funds any overruns of the Contract Sum (or, if the Agreement is a CMGC Agreement, the Guaranteed Maximum Price) not approved by Agreed Change as provided in Section 5.1.2.

Article 3. COMPLETION, TIME, AND DELAYS IN CONSTRUCTION

- 3.1 Time of the Essence.** The Work shall be performed in accordance with the Milestone Schedule and other schedules approved by Owner under the Contract, subject to Excused Delay and adjustment in accordance with the terms of the Agreement and these General Conditions of the Contract.
- 3.2 Substantial Completion.** "Substantial Completion" shall have been achieved when the Work is sufficiently complete in accordance with the Contract Documents so (i) Owner can occupy and utilize the Site for its intended use, (ii) a temporary or permanent certificate of occupancy for the Project (or, if the AHJ does not issue certificates of occupancy for projects like the Project and a certificate of occupancy is not necessary for Owner's use of the Project for its intended purpose, a certificate of compliance) and all other governmental permits for the occupancy and use of all of the Project have been issued, (iii) all systems to be constructed or installed by Contractor are fully functional, (iv) Contractor has delivered the As-Builts, and (v) the Work is complete except for minor items set forth on the Punch List which are not required to be completed for Owner to occupy and use the Building for its intended purpose, which can reasonably be completed within thirty (30) days, and the completion of which while Owner and its licensees occupy the Site will not interfere with such use and occupancy of the Site (including applicable parking and recreational facilities) for their intended purpose and will not delay or render more expensive in any material way the completion and correction of the Punch List items. Contractor acknowledges that the standard for Substantial Completion of an educational facility is significantly more stringent than the standard customary in the construction industry generally because of the intensive uses to which educational facilities are put. Contractor shall construct the Work and achieve Substantial Completion of all Work on or before the Required Substantial Completion Date.
- 3.3 Final Completion.** "Final Completion" shall have been achieved when (i) all of the Work has been finally completed in accordance with the Contract Documents and all final certificates of occupancy required by Current Laws have been issued, (ii) the walk-through inspection of the Work confirms completion of the Punch List items, and (iii) any other matters required to be completed to finish the Work and render the Project fully complete and ready for use and occupancy shall have been completed. When Contractor has completed the Punch List items for the Work, Contractor shall request a walk-through inspection to confirm the completion of those items, which Owner and Contractor shall schedule at a mutually convenient time, but in no event later than five (5) business days after Contractor notifies Owner of its completion of the Punch List for such portion of the Work. Contractor shall achieve Final Completion of all Work on or before the Required Final Completion Date.

3.4 Excused Delay. If Contractor is delayed at any time in the progress of the Work or the Required Substantial Completion Date is delayed due to the following causes (“**Excused Delay**”), the Required Substantial Completion Date and Required Final Completion Date shall be extended by a period of time equal to the number of days of Excused Delay (provided that, for any day on which two or more Excused Delays overlap, Contractor shall be allowed only one day of Excused Delay):

3.4.1 Owner Delay.

3.4.1.1 An “**Owner Delay**” shall be a delay caused (i) by the act or neglect of Owner, (ii) (if the Agreement is a CMGC Agreement) by the failure of Owner during the Design Phases to approve or submit comments on any Submission or other plans in the time required by the Project Schedule approved by Owner, or (iii) by the failure of Owner to execute any documents necessary for the performance of the Work, including the granting of easements across the Site or the disbursement of necessary funds to Contractor for payments of amounts due to Contractor hereunder (not including amounts being disputed); but only to the extent that the act giving rise to the claimed Owner Delay actually delays progress on the critical path to completion of the Work.

3.4.1.2 In order to claim that an Owner Delay has occurred, Contractor shall be required to notify Owner of the claimed Owner Delay promptly, and in any event before the end of the second (2nd) business day, after the start of the claimed Owner Delay. Any such notice shall specify the occurrence of the claimed Owner Delay, the nature of the cause of the claimed Owner Delay, and the Work that is affected by the claimed Owner Delay. An Owner Delay shall be deemed to have commenced on the day that it begins if such notice is timely given, or, if such notice is not timely given, shall be deemed to have commenced on the first business day after such notice is given.

3.4.2 Weather Delay.

3.4.2.1 In order for a weather delay (a “**Weather Delay**”) to occur, the Lost Weather Days in any calendar month must exceed the normal number of such days for such month set forth below. The Weather Delay, if any, shall be the number of days of such excess; provided that no Weather Delay shall have occurred except to the extent that Work which needs to be performed during the period of time affected by adverse weather is actually delayed in a manner that delays the critical path to completion of the Work. To the extent that the number of Lost Weather Days in any month is smaller than the normal number of Lost Weather Days in such month set forth below, the difference shall be carried forward to the following month (and, to the extent not then consumed, the ensuing months) and used to offset any Lost Weather Days in such following month or months. Contractor and Owner agree that the normal number of such delays for each month is as follows:

January:	6 days
February:	6 days
March:	5 days
April:	5 days
May:	5 days
June:	4 days
July:	4 days
August:	4 days

September: 3 day
October: 4 days
November: 5 days
December: 6 days

3.4.2.2 As used herein, a “**Lost Weather Day**” shall mean a day during which actual adverse weather prevents work on activities that need to be performed on that day in accordance with the Project Schedule for fifty percent (50%) or more of Contractor’s scheduled Work for such day.

3.4.2.3 Contractor shall report, by facsimile notice, to Owner (i) no later than 10:30 a.m. (in the time zone in which the Site is located) on each day Contractor claims to be a Lost Weather Day or (ii) if Work on the Project has commenced for such day, within one hour of Contractor’s decision to suspend Work because of such adverse weather. Such report shall state that Contractor considers that a Lost Weather Day is occurring and shall describe the weather conditions experienced and how the weather conditions have affected the Scheduled Work for such day. Unless Contractor gives such timely notice as to any day when work is adversely affected by adverse weather, Contractor shall not be entitled to claim such day is a Lost Weather Day.

3.4.3 **Force Majeure Delays.**

3.4.3.1 A “**Force Majeure Delay**” shall be a delay which could not reasonably have been anticipated or avoided by Contractor and which is caused by labor disputes (which are not limited in effect to Contractor or the Subcontractor, Sub-Subcontractor, or Supplier but are generally applicable to contractors at least in the area where the portion of the Work affected is being performed); fire; flood; earthquake; riot; war; insurrection; unusual delay in transportation (which is generally applicable in the area where the portion of the Work affected is being performed); fuel, material, or labor shortages (which are generally applicable in the area where the portion of the Work affected is being performed); unavailability, action, or inaction of public authorities (including delay of governmental approvals in excess of that normally to be expected, as shown on the Milestone Schedule) not arising out of the fault of Contractor; or unavoidable casualties; provided that delays caused by adverse weather conditions shall not be Force Majeure Delays. No Force Majeure Delay shall have occurred, however, except to the extent that the critical path to completion of the Work is actually delayed.

3.4.3.2 In order to claim that a Force Majeure Delay has occurred, Contractor shall be required to notify Owner promptly, and in any event within two (2) business days, after the claimed Force Majeure Delay becomes known to Contractor. Any such notice shall specify the occurrence of the claimed Force Majeure Delay, the nature of the cause of the claimed Force Majeure Delay, the Work that is affected by the claimed Force Majeure Delay, and whether such Force Majeure Delay has ended (in which case the date on which it ended shall be stated) or is then continuing. A Force Majeure Delay shall be deemed to have commenced on the day that it begins if such notice is timely given, or, if such notice is not timely given, shall be deemed to have commenced on the day after such notice is given.

3.4.4 Any dispute as to whether an Excused Delay has occurred shall be a Dispute and shall, at the request of either Contractor or Owner, be submitted to Dispute Resolution.

3.5 Guarantee of Required Substantial Completion Date and Required Final Completion Date.

- 3.5.1 Time is of the essence in the Contract with respect to the Required Substantial Completion Date and Required Final Completion Date. As a remedy for Contractor's failure to meet the Required Substantial Completion Date and Required Final Completion Date (as each may be extended by the terms of the Contract Documents), Contractor shall be liable for liquidated damages for each day after the Required Substantial Completion Date until the Work is Substantially Complete and each day after the Required Final Completion Date until the Work is Finally Complete.
- 3.5.2 Should Contractor fail to Substantially Complete the Work by the Required Substantial Completion Date, Contractor shall pay to Owner as liquidated damages the amounts set forth on Exhibit A to the Agreement for each day after the Required Substantial Completion Date until the Work is Substantially Complete. Should Contractor fail to Finally Complete the Work by the Required Final Completion Date, Contractor shall pay to Owner as liquidated damages, in addition to any liquidated damages that may be due under the foregoing sentence, the amounts set forth on Exhibit A to the Agreement for each day after the Required Final Completion Date until the Work is Finally Complete.
- 3.5.3 Contractor shall pay such liquidated damages (without offset or deduction for any amounts Contractor claims Owner then owes or otherwise) by certified or cashier's check or by wire transfer of immediately available funds to a bank account designated by Owner within thirty (30) days of receipt of invoice from Owner for same, which Owner may issue from time to time until Substantial Completion and/or Final Completion, as applicable, has occurred. Any such amounts not paid on or before thirty (30) days after receipt of invoice shall accrue interest at the default rate of fifteen percent (15%) per annum from the date due until and including the date paid. In the alternative, Owner shall have the right to offset any such amounts owed to Owner as liquidated damages in whole or in part against amounts due to Contractor under the Contract.
- 3.5.4 Owner's right to liquidated damages pursuant to this Section 3.5 shall be in lieu of any other damages Owner may be entitled to collect as a result of Contractor's delay in achieving Substantial Completion of the Work on or before the Required Substantial Completion Date or in achieving Final Completion of the Work on or before the Required Final Completion Date, as applicable; provided that (i) such liquidated damages shall not be in lieu of or prevent Owner from exercising any other right or remedy for delay (other than collection of damages), such as, by way of example and not by way of limitation, remedies to terminate the Contract or to take over the Work, (ii) such liquidated damages are only for the failure of Contractor to achieve the required degree of completion of the Work by the applicable date and are not in lieu of any right or remedy that Owner has for any other breach, default, or failure to perform under the Contract (for example, and not by way of limitation, defective work or the filing or assertion of claims by Subcontractors or Sub-subcontractors), and (iii) in addition to liquidated damages, to the extent that the failure to achieve any scheduled stage of completion (other than Substantial Completion or Final Completion) designated in the Milestone Schedule as a significant milestone (for preparations or installations that Owner will do or for other activities of Owner) on or before the date therefor provided on the Milestone Schedule results in specific out-of-pocket costs or other specific damages to Owner (such as the cost of storing equipment ordered that the Building should have been sufficiently finished to house at that stage according to the Milestone Schedule), Contractor shall pay to Owner the amount thereof.

3.6 Extraordinary Measures.

- 3.6.1 If the progress of the Work falls behind that required by the Milestone Schedule (as revised to reflect any Excused Delay) in any material way, if requested by Owner, Contractor shall work additional shifts or overtime, supply additional manpower or equipment, or take other similar measures, as specified by Owner, and shall continue such measures until the progress of the Work has reached the stage then required by the Milestone Schedule (as revised to reflect any Excused Delay). Contractor shall not be entitled to an increase in the Contract Sum on account of such measures.
- 3.6.2 Owner may further direct that Contractor take the measures described in Section 3.6.1 above to make up time lost to Excused Delay, in which event Owner's directive shall be a Change Directive to the extent of the additional work necessary to recover the time lost to the Excused Delay, Contractor shall perform the requested work in accordance with Section 5.1, and the Contract Sum shall be adjusted as provided in Sections 5.1 and 5.4; provided, however, that only the incremental costs of such acceleration incurred in excess of those costs necessary to bring the progress of the Work into conformance with the Milestone Schedule (as adjusted for Excused Delay) shall be included in any increase to the Contract Sum. Alternatively, Owner may at its option submit a Proposed Change for such work in accordance with Section 5.2.
- 3.6.3 Contractor shall, within five (5) calendar days after Owner's written request, provide Owner a recovery schedule setting forth in complete detail the acceleration of the Work in accordance with the provisions of this Section 3.6.

Article 4. PROJECT AND CONSTRUCTION MANAGEMENT

4.1 General Scope. Unless otherwise specifically provided in the Contract Documents, the scope of Contractor's Work, includes all labor, materials, equipment, tools, construction equipment, machinery, water, heat, utilities, transportation, and other facilities and services necessary for the proper execution and completion of the Work, whether temporary or permanent and whether or not to be incorporated into the Work.

4.2 Project Schedule.

- 4.2.1 Contractor shall, within five (5) business days after the execution of the Agreement, submit an interim CPM schedule to Owner's Project Manager (the "**Interim Schedule**"). The Interim Schedule shall include as many activities as are reasonably necessary to sufficiently detail the work to be performed during the first ninety (90) working days and a summary schedule of the Work for the entire Project. Until the preparation of the Project Schedule in accordance with Section 4.2.2 below, the Interim Schedule shall be used to manage the scheduling and coordination of the Work.
- 4.2.2 Within sixty (60) calendar days after the date of the Agreement, Contractor shall submit to the Owner's Project Manager a detailed CPM schedule for the entire Project (the "**Project Schedule**") in Primavera P6 format, including all of the items required by Exhibit G to the Agreement. The Project Schedule shall be updated at least monthly and submitted with each Application for Payment. Contractor shall also maintain a ninety (90) day look-ahead schedule showing the activities to be performed within the immediately forthcoming ninety (90) days and shall provide a copy of such schedule to Owner upon request.
- 4.2.3 The Project Schedule shall be cost-loaded and conform to the Schedule of Values approved by Owner, and Contractor shall keep current the cost information included in the Project Schedule. If the Agreement is a CMGC Agreement, Contractor may defer

cost-loading the Project Schedule until the approval of the Second Cost Estimate but shall submit a fully cost-loaded Project Schedule within ten (10) days after such approval.

4.2.4 The Interim Schedule and Project Schedule shall conform to the Milestone Schedule. In the event of conflict between the Milestone Schedule and the Project Schedule, the Milestone Schedule shall prevail unless otherwise specifically agreed in writing by Owner. No proposed changes in the Project Schedule that would extend the Required Substantial Completion Date or Required Final Completion Date shall be binding on Owner by reason of having been included in the Project Schedule.

4.2.5 Contractor shall record the daily progress of the Project in a daily log available to the Owner and the Architect. Contractor shall submit a weekly written progress report and summaries of project-related meetings to the Owner and the Architect, including information on the subcontractors' work, labor resource levels by trade, safety violations, inspections or tests, and the percentage of completion of items relative to the approved Project Schedule.

4.3 Supervision and Construction Procedure. Contractor shall perform, supervise, direct, and coordinate the Work in accordance with the Contract Documents, and shall be solely responsible for all construction means, methods, techniques, sequences, and procedures. Contractor shall use its best skill and attention in the prosecution of the Work. Contractor shall take reasonable measures to verify that significant Subcontractors and Suppliers have, where appropriate because of the possible unavailability of labor or materials, made reasonable arrangements for alternate sources of labor and materials so that the Project is not delayed by shortages of labor and materials which might reasonably be anticipated. Contractor shall be responsible to Owner for acts and omissions of Contractor's employees, Subcontractors and Sub-subcontractors and their agents and employees, and other persons performing portions of the Work under a contract with Contractor. Contractor shall be responsible to ensure that the Work is properly sequenced and that each stage of the Work is in proper condition to receive subsequent Work.

4.4 Books and Records. Contractor shall keep and maintain all books and records with respect to the Work including, without limitation, maintaining an accurate record of the Cost of Work. A copy of all such books and records shall be kept at the Site or at Contractor's office in the Denver, Colorado metropolitan area and shall be open to inspection by Owner and Architect at all reasonable times.

4.5 Site Investigation; Field Verification.

4.5.1 Contractor shall obtain information regarding existing facilities and building systems sufficient to support Contractor's Work. Such investigation shall include visual examination of actual conditions at the Site and conducting conferences with Owner's personnel familiar with the existing facilities. Contractor shall confer with Architect and Owner as may be necessary for Contractor to obtain a complete understanding of the Project and Owner's requirements for the Project insofar as they relate to the Contractor's Work.

4.5.2 Before ordering any material or doing any Construction Work, Contractor shall verify all measurements shown in the Construction Documents at the Site of the work and shall be responsible for the correctness of the same. Any differences between conditions on the Site and the Contract Documents that Contractor may observe shall be promptly reported in writing to the Architect before proceeding with any affected materials ordering or Work.

4.6 Use of Site.

- 4.6.1 Contractor shall confine operations at the Site to areas permitted by Current Laws, ordinances, permits, and the Contract Documents and shall not unreasonably encumber the Site with any materials or equipment. Contractor shall maintain the Site in a safe condition. Contractor shall not load any structure or earth, or permit any part thereof to be loaded, with a weight that will endanger safety or stability.
- 4.6.2 If any portions of an existing building are to be remodeled or repaired, such portions shall be adequately partitioned off with dust-proof partitions. Contractor's Project Schedule and management of the Site and Work shall be planned and executed to permit the completion of the Work in an orderly fashion during the school vacation periods, if any, during which it is scheduled to occur, or in such manner as to permit full use of the Site by Owner without impairment of any existing facilities.
- 4.6.3 Owner shall have the right to take possession of and to use any completed or partially completed portions of the Work, even if the time for completing the entire Work or such portions of the Work has not expired and even if the Work has not been finally accepted. Such possession and use shall not constitute an acceptance of such portions of the Work. Architect and Contractor shall conduct an inspection of such portions of the Work before Owner occupancy thereof. A report of items incomplete, damaged or otherwise unacceptable will be prepared by the Architect and delivered to the Contractor and Owner. This report shall be used as a record of the condition of such Work at the time of Owner's occupancy thereof and shall not be construed to constitute acceptance of such Work by Owner. Any material delays resulting from such occupancy of the Work by Owner shall constitute Owner Delay (but only to the extent that such occupancy causes actual delays in the Work that satisfy all the requirements necessary to be an Owner Delay under Section 3.4.1) unless such occupancy is rendered necessary by Contractor's failure to complete the Work in accordance with the Milestone Schedule and Project Schedule, as adjusted for Excused Delay.
- 4.6.4 If the Site is occupied by Owner, Contractor's access to the Site for Construction Work shall be limited during the school year to times outside normal school business hours and such other days and times as Owner may specifically authorize in writing. Contractor's access to an occupied Site outside the school year shall be limited to normal business hours and such other days and times as Owner may specifically authorize in writing. Contractor shall have access to an occupied Site during school district holidays only with Owner's specific written authorization.

- 4.7 Cleaning Up.** Contractor, at all times, shall keep the Work in neat and clean condition and free from waste materials or rubbish caused by its operations. At least weekly, or more often as necessary to comply with the requirements of the previous sentence and maintain a safe and efficient site, Contractor shall clean up the Site and remove all waste and materials that have not previously been removed, remove all equipment not then being used on a regular basis, remove any excess materials, and take all other actions reasonably necessary to maintain the Site in a good, clean, and orderly condition. At the completion of the Work, Contractor shall remove all its waste materials and rubbish from and about the Project as well as all of its tools, construction equipment, machinery, and surplus materials and shall clean all glass surfaces and leave the Site "broom clean" or its equivalent, except as otherwise specified. If Contractor fails to clean up as required hereby, Owner may do so and one hundred fifty percent (150%) of the reasonable cost thereof shall be paid by Contractor or deducted from any amount thereafter becoming payable to Contractor. No such charge by Owner shall be included within the Cost of Work.

4.8 Coordination with Owner's Consultants. Owner may engage consultants to inspect portions of the Work. Contractor shall cooperate with such inspections, review the inspection and laboratory reports prepared by Owner's separate consultants and advise and assist Owner in resolving any concerns raised by those reports. Contractor shall promptly notify Owner and Architect when the following work is ready for inspection before enclosing any such work:

4.8.1 Foundation bearing surfaces (where applicable)

4.8.2 Reinforcing steel after placing and prior to pouring concrete or grout.

4.8.3 Concrete placement.

4.8.4 Structural steel prior to being enclosed or covered.

4.8.5 Mechanical work prior to being enclosed or covered.

4.8.6 Electrical work prior to being enclosed or covered.

4.8.7 Each coat of specified waterproofing.

4.9 Drawings and Specifications at Site. Contractor shall maintain at the Site for Owner and Architect one copy of all drawings, specifications, addenda, approved shop drawings, Change Directives, Agreed Changes, Change Orders, and other modifications in good order and marked daily to record all changes made during construction. Contractor shall keep permanent records of all lines and levels required for excavation, grading and foundations. These drawings, specifications, and similar items shall be made available to Owner and Architect at the Site.

4.10 Manufacturers' and Subcontractors' Warranties; Manuals. Upon Substantial Completion, Contractor shall compile and deliver to Architect operation and maintenance manuals for each building included in the Project, including a copy of each warranty extending beyond the Warranty Period and a copy of each instruction manual provided to Contractor by manufacturers of equipment, machinery, and similar items, a summary of any warranty time limitations contained in third-party manufacturers' warranties, and instructions to Owner's representatives in the operation of mechanical, electrical, plumbing, and other systems constituting part of the Work. Contractor shall provide two (2) copies of each such manual for each building. Contractor shall arrange for manufacturers' representatives to assist in equipment and system start-up.

4.11 Unsuitable Conditions. The Contractor shall not perform any Work at any time, or permit any Work to be done, under any conditions unsuited to its proper execution, safety, and reliability. Any costs resulting from ill-timed work by Contractor shall be borne by Contractor, except to the extent otherwise specifically provided herein.

4.12 Owner's Separate Work.

4.12.1 Contractor acknowledges that Owner may enter into separate contracts for work to take place on the Site at the same time as the Construction Work. Contractor shall coordinate its efforts with the other activities of Owner on the Site, and Owner shall require its other contractors to coordinate their activities with Contractor, to enable the work under each contract to proceed without undue interference and to allow each contractor to perform its work that relates to the work of other contractors in a timely manner.

4.12.2 In the event of any alleged damage caused by Contractor to another contractor's work or vice versa, Contractor shall negotiate in good faith with the other contractor to settle the claim. Contractor shall indemnify, defend and hold harmless Owner from and against

any Claims of damage to another contractor's work to the extent of the negligence or fault attributable to the acts or omissions of Contractor, a Subcontractor, a Sub-subcontractor, anyone directly or indirectly employed or engaged by them or anyone for whose acts they may be liable.

- 4.12.3 If any part of the Contractor's Work depends upon the work of any other contractor, the Contractor shall inspect and promptly (and in any event within two (2) days after discovery) report to the Architect any defects in the other contractor's work that render it unsuitable for proper execution of the Work. Contractor's failure so to inspect and report shall constitute an acceptance of the other contractor's work as fit and proper for the reception of the Contractor's Work, except as to latent defects that may become apparent in the other contractor's work only after the execution of the Contractor's Work. The Contractor shall measure work already in place and shall immediately report to the Architect any discrepancy between the executed work and the Contract Documents.
- 4.13 Quality Control.** Contractor shall establish and maintain a quality control program specific to the Project. Such program shall include a Project-specific quality control plan, regularly scheduled meetings to discuss quality control issues and objectives, the submittal review and approval processes required by the Contract Documents, appropriate testing and inspections, and documentation and tracking systems appropriate to the Project. A proposed written program shall be submitted to the Owner for review and approval before the commencement of the Construction Work.
- 4.14 Issue Tracking.** Contractor shall implement an effective system for recording and tracking requests for clarification and instructions, submittals, approvals, information and other responses from the Architect, Agreed Changes, Change Directives, Change Requests and other communications that define or raise questions about the Work. At each weekly progress meeting, Contractor shall identify and raise for discussion any open issues that may impact the schedule or cost of the Project.
- 4.15 Self-Work.** The Cost of Work shall, so long as the same conforms to all the requirements and restrictions set forth herein, include the labor costs incurred by Contractor in performing Self-Work. No labor costs for Self-Work shall be permitted to the extent that (i) the same exceed the lowest reasonable cost thereof which would be provided by capable and qualified Subcontractors and/or (ii) such Self-Work fails to meet standards of quality available from capable and qualified Subcontractors.
- 4.16 Project Manager and Superintendents.** The person, if any, designated as the Contractor's Project Manager and other persons designated as key members of the Project Team on Exhibit A to the Agreement shall be assigned exclusively to the Project until the Project (including the Punch List) has been completed, except to the extent that assignment of such persons to other projects is approved in writing by Owner. Contractor's Project Manager shall have authority to act on behalf of and bind the Contractor, and directions given to Contractor's Project Manager shall be as binding as if given to the Contractor. Contractor shall keep Contractor's Project Manager and necessary assistants, all of whom shall be satisfactory to Owner, on the Site at all times work is being performed. The key members of the Project Team shall not be changed without Owner's prior written consent, except in the event of termination of such persons' employment by Contractor.
- 4.17 Federally Funded Projects.** If Exhibit A to the Agreement indicates that any funds from United States government sources are to be used to pay for the Project, Contractor shall be responsible to comply with all Current Laws applicable thereto, including the Davis Bacon and Related Acts, regulations promulgated thereunder, and all other laws applicable to federally-assisted construction projects, including without limitation Title 29, Subtitle A, Part 5 of the Code of Federal

Regulations. Certain provisions required by 29 C.F.R. § 5.5 are attached to the Agreement as Exhibit J.

- 4.18 Extra Inspections.** If Contractor notifies Owner that Substantial Completion, Final Completion, or other milestones in the Milestone Schedule have been achieved but the Architect determines that the required degree of completion has not been achieved, Contractor shall be responsible to reimburse out of its own funds any fees or charges payable by Owner for later re-inspection of the Work.

Article 5. CHANGES IN THE WORK

5.1 Change Directive.

- 5.1.1 Owner may, without invalidating the Contract, direct a change in the Work and may state a proposed basis for adjustment, if any, in the Contract Sum, Required Substantial Completion Date, or Required Final Completion Date, or any combination of them, by a **"Change Directive."** Upon receipt of the Change Directive, Contractor shall promptly proceed with the change in the Work involved and advise Owner of its disagreement, if any, with the proposed adjustment of the Contract Sum, Required Substantial Completion Date and Required Final Completion Date, if any.
- 5.1.2 A Change Directive signed by Contractor indicates the agreement of Contractor therewith, including adjustment of the Contract Sum, Required Substantial Completion Date or Required Final Completion Date, if such is proposed by Owner. Such agreement shall be effective immediately and shall be an **"Agreed Change,"** which term, as used herein, shall mean any change in the Work as to which Contractor and Owner have agreed as any changes in the Contract Sum, the Required Substantial Completion Date and the Required Final Completion Date. If no such agreement is reached, Contractor shall give notice to Architect and Owner of its objection to the change, if any, in the Contract Sum, Required Substantial Completion Date and/or Required Final Completion Date proposed in the Change Directive within five (5) business days after receipt of the Change Directive. If Contractor fails to give such notice within such time, Contractor shall be deemed to have agreed to the proposal contained in the Change Directive, and the Change Directive shall become an Agreed Change.
- 5.1.3 If Contractor timely objects to any adjustment of the Contract Sum, Required Substantial Completion Date or Required Final Completion Date as a result of a Change Directive, then, unless otherwise agreed in writing by the Parties, the disagreement shall be a Dispute and may be submitted to Dispute Resolution.

5.2 Proposed Changes.

- 5.2.1 Owner may, without issuing a Change Directive, issue a request for the effect of a proposed change by a **"Proposed Change."** Any Proposed Change shall be in the form of a Change Directive, except that, instead of setting forth Owner's proposal for the change, if any, in the Contract Sum, Required Substantial Completion Date or Required Final Completion Date, the same shall request a proposal from Contractor therefor.
- 5.2.2 Contractor shall, as quickly as is reasonably possible after Contractor's receipt of the Proposed Change, respond in writing to each Proposed Change with a statement containing Contractor's proposal for changes in the Contract Sum, Required Substantial Completion Date or Required Final Completion Date on account of the change in the Work proposed in the Proposed Change. Such statement shall set forth specifically the

deadline by which Owner needs to approve such proposal for Contractor to proceed with the Proposed Change without delaying the Work.

- 5.2.3 Following Contractor's delivery of its proposal based on a Proposed Change, Owner may:
- 5.2.3.1 decide not to make the change requested by the Proposed Change, in which case no notice shall be required to be given to Contractor (and if Owner fails to respond on or before the deadline specified in Contractor's proposal, Owner shall be deemed not to have accepted Contractor's proposal),
 - 5.2.3.2 agree in writing to Contractor's proposal by notice given to Contractor on or before the deadline set forth in Contractor's proposal, in which case, the Proposed Change, with any changes in the Contract Sum, Required Substantial Completion Date or Required Final Completion Date determined in accordance with Contractor's proposal, shall become an Agreed Change, or
 - 5.2.3.3 issue a Change Directive with respect to any part or all of the changes, in which case the Change Directive shall be processed in the same manner as any other Change Directive without consideration being given to Contractor's proposal for determining the Contract Sum, Required Substantial Completion Date and Required Final Completion Date.

5.3 Changes not Requiring a Change Order. The Architect may order minor changes in the work, not involving an adjustment in the Contract Sum or an extension of the Required Substantial Completion Date or Required Final Completion Date and not inconsistent with the intent of the Contract Documents, by notice to Owner and Contractor specifying the change proposed and making reference to this Section 5.3. No such proposed change shall adversely affect the quality or the value of the Work described in the Contract Documents, or provide for a substitution of materials of an inferior quality to those specified in the Construction Documents. Owner may object to such proposed change by notice given to Architect and Contractor on or before the end of the fifth (5th) business day after Architect's notice is received by Owner, in which case the change shall be rejected and not implemented by Contractor. If Owner approves the change or fails to object thereto within such time, such change shall become an Agreed Change.

5.4 Determination of the Cost or Savings Attributable to a Change Directive. Changes in the Contract Sum resulting from a Change Directive shall be determined by agreement of Contractor and Owner, acting reasonably, based on any or all of the following:

- 5.4.1 reasonable estimates,
- 5.4.2 unit prices, or
- 5.4.3 other reasonable method for determining reasonable expenditures and savings.

5.5 Change Pricing. All pricing information provided by Contractor in connection with a Change Directive or Proposed Change shall include itemized amounts for at least the following categories of costs (as applicable):

- 5.5.1 material quantities and unit prices by division;
- 5.5.2 labor costs based on stated estimated hours and hourly rates for each classification of labor;

- 5.5.3 field supervision costs;
- 5.5.4 costs of construction equipment;
- 5.5.5 insurance and bond premiums;
- 5.5.6 Social Security tax and other payroll and unemployment taxes; and
- 5.5.7 overhead and profit (based on the same percentage of Direct Hard Costs used to compute the Construction Fee, or, if the Construction Fee is an agreed lump sum, based on the same ratio that the originally agreed Construction Fee bears to the originally scheduled Direct Hard Costs).

When both additions and credits are involved in any one change, the change in the Contractor Fee (if the same is a percentage of the Direct Hard Costs) shall be figured on the basis of the net increase or decrease, if any. In no event shall the combined amount of overhead and profit for Subcontractors, Sub-subcontractors, and Contractor with respect to any additive change exceed fifteen percent (15%) of costs of labor and materials associated with the change that are payable under the Contract.

- 5.6 **Change Orders.** Each month, as part of the Application for Payment, Contractor shall prepare a “**Change Order**,” which shall be a summary of all Agreed Changes approved for such month, a summary of the Agreed Changes, if any, in the Contract Sum and Required Substantial Completion Date as a result of such changes. If, at the end of the month, any Change Directives have been issued as to which the changes, if any, in the Contract Sum and Required Substantial Completion Date have not been agreed to, the Application for Payment shall also include a list of all of such Change Directives.
- 5.7 **Tracking.** The Architect shall assign tracking numbers to Proposed Changes, Change Directives and Agreed Changes, and the Contractor shall assign tracking numbers to Change Orders, which the parties shall use in all correspondence related thereto for ease of reference.

Article 6. SUBCONTRACTORS, SUPPLIERS AND PERSONNEL.

6.1 Terms of Subcontracts.

- 6.1.1 Those portions of the Work that are not Self-Work as permitted hereby shall be performed under subcontracts or by other appropriate agreements with Contractor. By appropriate written agreement, Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to Contractor by terms of the Contract Documents and to assume toward Contractor all the obligations and responsibilities which Contractor, by the Contract Documents, assumes toward Owner. Each subcontract agreement shall satisfy all requirements therefor contained in the Contract Documents, shall preserve and protect the rights of Owner under the Contract with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies and redress against Contractor that Contractor, by the Contract Documents, has against Owner.
- 6.1.2 Each subcontract agreement shall contain a clause that allows Contractor to terminate a subcontract if the Subcontractor is added to the GSA Excluded Parties List Report during performance of the Work. Where appropriate (for example, for significant Subcontractors), Contractor shall require each Subcontractor to enter into similar

agreements with Sub-subcontractors. Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound. Subcontractors shall similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

6.1.3 Each contract entered into by Contractor with any Subcontractor shall require that each such Subcontractor include, in its respective contracts with any Sub-subcontractor, for the benefit of Owner, payment documentation requirements substantially similar to those set forth in the Contract Documents (including those providing for retainage, procedures for submitting applications for payment, and payment procedures), as well as any other provisions expressly stated in the Contract Documents to be included in each such Subcontractor's contracts with their respective Sub-subcontractors. Contractor shall require Subcontractors to submit applications for payment to the Contractor in time for the Contractor to submit its Application for Payment on the basis of such Subcontractors' Work within the time required by the Contract Documents.

6.1.4 Each subcontract agreement for a portion of the Work and each contract for supplying materials is assigned by Contractor to Owner; provided that the assignment is effective only after termination of the Contract by Owner for cause and only for those agreements which Owner accepts by notifying the Subcontractor or Supplier in writing at or after the time of such termination. Each subcontract agreement with a Subcontractor or each contractor with a supplier shall permit the subcontract agreement to be assigned to Owner and shall obligate the Subcontractor to recognize any such assignment which becomes effective and to render its performances thereunder to Owner after the effectiveness of any such assignment and shall provide that Owner shall be responsible to the Subcontractor only for those obligations of Contractor that accrue subsequent to Owner's exercise of any rights under this conditional assignment. Except as provided in this paragraph, nothing in the Contract Documents shall be deemed to create any contractual relationship whatsoever between any Subcontractor or Sub-subcontractor and the Owner.

6.2 Equal Opportunity. Owner intends and expects that its contracting processes and the contracting processes of its professional designers and consultants, contractors, and vendors, including professional designers and consultants, shall provide equal opportunity without regard to gender, race, ethnicity, religion, age, or disability, and that its vendors shall make available equal opportunities to the extent third parties are engaged to provide goods and services to Owner as contractors, subcontractors, consultants, vendors, or otherwise. Accordingly, Contractor shall not discriminate on any of the foregoing grounds in the performance of the contract, and shall make available equal opportunities to the extent third parties are engaged to provide services in connection with performance of the contract. Joint ventures, partnerships, or other cooperative relationships between contractors or vendors and MBE, WBE, SBE, and DBE firms may be considered one indication of good faith intention to comply with this requirement. Each contractor and vendor shall disseminate information regarding all subcontracting opportunities under this contract in a manner reasonably calculated to reach all qualified potential subcontractors who may be interested. Contractor shall comply with, and maintain records of its compliance with, the provisions of Exhibit F to the Agreement with respect to equal opportunity contracting and shall make such records available to the District upon the District's request.

6.3 Discipline; Sufficiency of Skilled Workers; Removal. Contractor shall, at all times, enforce strict discipline and good order among its employees and Subcontractors, and shall not employ or engage any unfit person or anyone not skilled in the task assigned to him for any portion of the Work. Contractor shall require that plumbers, pipefitters, and electricians have sufficient numbers of journeymen workers on the site to maintain on the site a ratio of journeymen to apprentices of

not less than one to two (1:2). Smoking, possession of weapons, possession and/or consumption of alcoholic beverages and any other activities which are deleterious to Owner's operations are strictly prohibited. Discourteous or aggressive behavior toward staff, students or the general public will not be tolerated. Owner may require by notice to Contractor that any worker that Owner determines to be careless, incompetent, unskilled, or otherwise objectionable be dismissed from work on the Project.

- 6.4 Colorado Labor.** As required by C.R.S. § 8-17-101, Colorado Labor shall be employed to perform the work to the extent of not less than eighty percent at each type or class of labor in the several classifications of skilled and common labor employed on the Project.

Article 7. INSPECTIONS; CORRECTION OF DEFECTS

- 7.1 Inspections.** Owner, Architect and their representatives and consultants shall have reasonable access to the Work during normal business hours and any non-business hours when construction is scheduled to occur, and Contractor shall permit and facilitate inspection of the Work by Owner, Architect, their representatives, and public authorities concerned with such Work.

- 7.3 Notice of Defect.** If prior to Substantial Completion, Owner or Architect determines that the Work is defective or not in accordance with the Contract Documents, Owner or Architect shall give written notice to Contractor promptly (i.e. within five (5) business days) after discovering such defect(s). Architect has authority to stop the Work whenever such stoppage may in Architect's judgment be necessary to insure the proper execution of the Work.

7.4 Warranty and Correction of Work During Construction.

- 7.4.1** Contractor warrants that all materials shall be new unless otherwise specified, and specifically approved in writing by Owner in each instance, and all of the Work will be performed in a good and workmanlike manner, free from faults and defects and in conformance with the Contract Documents. All Work not conforming to these standards, including substitutions not allowed by the Contract Documents, will be considered defective.
- 7.4.2** If required by Architect or Owner, and upon their written request therefor, Contractor shall furnish reasonable evidence as to the kind and quality of materials and equipment supplied by Contractor pursuant to the Contract.
- 7.4.3** Architect and Owner shall have the authority to reject Work not conforming to the Contract Documents. Contractor shall, upon the directive of the Architect, remove and replace any non-conforming materials, at Contractor's sole cost, without an adjustment in the Contract Sum or the Required Substantial Completion Date.
- 7.4.4** Contractor shall remove from the Site portions of the Work which are not in accordance with the requirements of the Contract Documents and are neither corrected by Contractor nor accepted by Owner. Contractor shall, if required by Owner, furnish evidence reasonably satisfactory to Owner as to the kind and quality of materials. No materials shall be substituted for those specified except by Agreed Change. Where standards, publications or other specifications of technical societies or testing organizations are identified in the Contract Documents, the latest revisions of the same as of the date of the Request for Proposals or bid opening shall govern unless indicated otherwise. No materials shall be substituted for those specified except by Agreed Change.
- 7.4.5** Contractor shall be responsible to correct, at its cost, any damage to other contractors' work resulting from the uncovering or correction of defects in the Work.

- 7.5 Uncovering Work.** The Work may be covered by Contractor as the Work progresses in accordance with the Milestone Schedule, Contract Documents and the Project Schedule. If a portion of the Work is covered contrary to Architect's written request delivered to Contractor or contrary to requirements specifically expressed in the Contract Documents, it must, if required in writing by Architect or Owner, be uncovered for Architect's and/or Owner's observation and be replaced at Contractor's expense without change in the Required Substantial Completion Date, Required Final Completion Date or the Contract Sum. If a portion of the Work has been covered in accordance with the Milestone Schedule, Contract Documents and the Project Schedule which Architect and Owner have not specifically requested to observe prior to its being covered, Architect or Owner may request to see such Work and it shall be uncovered by Contractor. If the Work is in accordance with the Contract Documents, costs of uncovering and replacement shall, by appropriate Agreed Change, be charged to Owner, and the time required to uncover and recover such Work shall be an Owner Delay (but only to the extent of that such activities cause actual delay in the Work that satisfies all the requirements necessary to be an Owner Delay under Section 3.4.1). If such Work is not in accordance with the Contract Documents, Contractor shall pay such costs unless the condition was caused by Owner in which event Owner shall be responsible for payment of such costs and the time lost in uncovering and recovering the Work shall not be an Owner Delay, and there shall be no change in the Required Substantial Completion Date.
- 7.6 Failure to Correct Defect.** If Contractor fails to correct defective or nonconforming Work in accordance with the above provisions, Owner may correct it, and an Agreed Change will be issued reducing the Contract Sum by 125% of Owner's out-of-pocket cost of correcting the Work. In the alternative, Owner may order Contractor to stop the Work, or any portion thereof, or may deduct 125% of the value thereof from Contractor's Applications for Payment, until Contractor corrects the defective or nonconforming Work as provided above.
- 7.7 Acceptance of Defective Work.** If Owner prefers to accept defective or nonconforming Work, it may do so in writing within ten (10) business days of the date it is discovered by Owner instead of requiring its removal and/or correction. In that event, Contractor and Owner shall execute an Agreed Change providing for an equitable reduction in the Contract Sum; or, if the amount is determined after Final Payment, Contractor shall pay the amount of such equitable reduction to Owner. If Owner and Contractor are unable to agree on the amount of such reduction of the Contract Sum within ten (10) business days after Owner determines not to replace the defective Work, the amount of such reduction shall be a Dispute and may be submitted to Dispute Resolution by either party.

Article 8. PROTECTION OF PERSONS AND PROPERTY

8.1 General Requirement.

- 8.1.1** Contractor shall take all necessary precautions for the safety of its employees and those of its Subcontractors and Sub-subcontractors (and any personnel of Suppliers or others on the Site) in connection with the Work, and shall comply with Current Laws regarding worker health and safety and the prevention of accidents or injury to persons on or about the Site (including the Occupational Safety and Health Act of 1970 as amended, the standards issued by the Secretary of Labor at 29 CFR Part 1926 and 29 CFR Part 1910 as amended, safety laws of the State of Colorado, and other safety laws and regulations).
- 8.1.2** Contractor shall take all necessary precautions for safety of and shall provide reasonable protection to prevent damage, injury, or loss to (a) persons on or about the Site, (b) the Work and materials and equipment to be incorporated therein, and (c) other property at the site or adjacent thereto such as, trees, shrubs, lawns, walks, pavements, roadways,

structures, and utilities not designated for removal, relocation or replacement in the course of the performance of the Work.

- 8.1.3 Contractor shall erect and properly maintain at all times reasonable safeguards and signage for the protection of workers and the public as required by the conditions and progress of the Work. As between Contractor and Owner, Contractor shall be responsible for initiating, maintaining, supervising and enforcing all safety precautions and programs in connection with the performance of the Work. Contractor's office on the Site shall be equipped at all times with articles necessary for giving first aid in the event of injury and illness. Contractor shall have standing arrangements for the immediate removal and hospital treatment of any person who may be injured or who may have become ill on the job.
 - 8.1.4 Contractor shall notify Owner of any work related injuries that result in "loss of work days" or require medical attention suffered by any employees of Contractor and any Subcontractors and Sub-subcontractors (including any personnel of Suppliers or others on the Site) within twenty four (24) hours of the occurrence of such injury, including a written report of how the injury occurred and what, if any, corrective actions have been implemented to prevent similar accidents from occurring on the Site in the future.
- 8.2 Underground Facilities.** Contractor shall physically verify the location of all buried utilities within twenty-five (25) feet of any excavation area before beginning excavation Work. The location of such utilities shall be recorded by a registered professional land surveyor and a map showing the precise locations of such utilities shall be provided to Architect and Owner in electronic (AutoDesk DWG) format. Contractor shall provide such information to its Subcontractors and personnel engaged in excavation work and shall be responsible to protect all such utilities from damage.
- 8.3 Public Ways.** Contractor shall take all appropriate precautions when obstructing or partially obstructing sidewalks, streets or other public ways, shall provide, erect and maintain barricades, temporary walkways, roadways, trench covers, colored lights or danger signals and any other devices necessary to assure the safe passage of pedestrians and automobiles, and shall obtain all required permits for such obstructions and safety structures.
- 8.4 Safety Equipment.** The Contractor shall provide all safety equipment necessary for Owner and Owner's consultants to inspect the Work in a safe manner, including harnesses, tie-offs and other special equipment that may be necessary for safe access to and observation of the Work.
- 8.5 Site Security.** Contractor shall take all appropriate measures to protect the Site, persons and materials stored thereon from theft, vandalism and other intrusion or harassment and shall comply with any standards, policies or directives of Owner with respect thereto, including:
- 8.5.1 Contractor shall not utilize any laborer, employee or subcontractor who has been convicted of a violent or sexual crime, crime involving a minor, or any other crime of such nature;
 - 8.5.2 Contractor, its laborers, employees or subcontractors, shall not fraternize or otherwise communicate with students except in cases of safety and/or emergencies;
 - 8.5.3 Contractor shall not allow any laborer, employee or subcontractor to wear clothing that is inappropriate for students to view ("Objectionable Clothing") and ensure that its laborers, employees and subcontractors maintain professional workmanlike attire. Owner, or its on-site personnel, shall determine, in its sole judgment, whether clothing is Objectionable Clothing;

- 8.5.4 Contractor shall ensure that its laborers, employees and subcontractors do not use or have in their possession any controlled substances on the Site including tobacco, alcohol, and illegal drugs; and
- 8.5.5 Contractor shall ensure that its laborers, employees and subcontractors do not possess any weapon.

8.6 Notice Requirements.

- 8.6.1 Whenever Owner's personnel becomes aware of any noncompliance with these requirements under this Article 8 or any condition which poses a serious or imminent danger to the health or safety of the public, Owner's staff or students, or other worksite personnel, Owner's Project Manager shall notify the Contractor orally, with follow up written confirmation, and request immediate corrective action.
- 8.6.2 Notice delivered to Contractor or Contractor's representative at the Site, either orally or in written form, in accordance with Section 8.6.1 shall be deemed sufficient notice of the noncompliance and that corrective action is required. After receiving such notice, Contractor shall immediately take all appropriate corrective action to eliminate the hazard.
- 8.6.3 If Contractor fails or refuses to promptly take proper corrective action, Owner may issue an order stopping all or part of the Work until satisfactory corrective action has been taken, and Contractor shall immediately comply with any such order. Owner's failure to issue such an order shall not relieve Contractor of the obligation to stop Work if necessary to properly correct a hazard. Contractor shall not be entitled to any equitable adjustment to the Contract Sum, Required Substantial Completion Date or Required Final Completion Date on account of any order to stop Work issued under this Article. The cure periods provided for Events of Default in Section 14.1 shall not be construed to limit the Owner's right to stop the Work in accordance with this paragraph.

Article 9. PERMITS AND LICENSES; COMPLIANCE WITH CURRENT LAWS

- 9.1 Permits.** Before commencing Construction Work, Contractor shall obtain and pay for all building permits, applications, licenses and inspections required by the AHJ and any other government agency with jurisdiction for the prosecution of the Work, including any applicable state mechanical and electrical permits and City and County of Denver hotwork permits. Contractor shall pay all applicable State of Colorado Electrical, Plumbing and Boiler Inspection fees. Without limiting the generality of the foregoing sentence, Contractor shall, at its cost, obtain all required permits and pay all building permit fees, water department system development fees, wastewater management fees, sewer availability and metropolitan district fees, mechanical, electrical, plumbing and boiler permit and inspection fees.
- 9.2 Licensed Trades.** All Work shall be performed by licensed workers where such licenses are required by law, including state-licensed plumbing and electrical trades and Denver Fire Department licensed fire safety systems installers. It is the responsibility of the Contractor to investigate whether licensing is required for the performance of a particular part of the Work. Fire safety systems requiring licensing may include Automatic Fire Sprinkler Systems, Fire Alarm and Detection Systems, Special extinguishing systems (wet/dry chemical systems), Portable Fire Extinguishers, Fire Pumps, Emergency Generators, Emergency Communications Systems and Radio Signal Enhancement Systems.

9.3 Licensed Supervision. In the event Current Laws require that the Work or any part thereof be supervised by a licensed supervisor, the Contractor shall provide a licensed on-Site supervisor to supervise the execution of the Work or such part thereof, as applicable.

9.4 Worker Status. The Contractor shall certify the status of its and its Subcontractors' workers as provided herein.

9.4.1 All Contractors: Contractor agrees to the following terms and shall submit certification thereof from time to time as required by Owner:

9.4.1.1 Contractor certifies that it has complied with and shall during any Work continue to comply with the provisions of C.R.S. § 8-17.5-101, *et seq.* As further provided in that statute, Contractor shall not knowingly employ or contract with an illegal alien to perform work under the Contract or enter into a contract with a Subcontractor that fails to certify to Contractor that the Subcontractor shall not knowingly employ or contract with an illegal alien to perform work under the Contract.

9.4.1.2 Contractor represents, warrants, and agrees that Contractor:(i) through participation in the "E-Verify" Program administered by the Social Security Administration and Department of Homeland Security, has verified that it does not employ any illegal aliens; and (ii) otherwise will comply with the requirements of C.R.S. § 8-17.5-102(2)(b). Without limiting the generality of the foregoing provisions:

(a) Contractor represents and warrants that it has confirmed the employment eligibility of all employees who are newly hired for employment to perform any part of the Work through either the "E-Verify" program or the Colorado Department of Labor and Employment; and

(b) Contractor shall not use either the "E-Verify" program or the Colorado Department of Labor and Employment program procedures to undertake preemployment screening of job applicants while performing Work.

9.4.1.3 If Contractor obtains actual knowledge that a Subcontractor performing Work knowingly employs or contracts with an illegal alien, Contractor shall:

(a) Notify the Subcontractor and Owner within three (3) days that the Contractor has actual knowledge that the Subcontractor is employing or contracting with an illegal alien; and

(b) Terminate the subcontract with the subcontractor if within three (3) days of receiving such notice the Subcontractor does not stop employing or contracting with the illegal alien; except that the Contractor shall not terminate the contract with the Subcontractor if during such three (3) days the Subcontractor provides information to establish that the Subcontractor has not knowingly employed or contracted with an illegal alien.

9.4.1.4 Contractor shall cause each Subcontractor and all Sub-subcontractors to provide to Contractor the certifications required by Section 9.4.1.1 above and to comply with the provisions of Sections 9.4.1.2 through 9.4.1.5.

9.4.1.5 Contractor shall comply with all reasonable requests made in the course of an investigation under C.R.S. § 8-17.5-102 by the Colorado Department of Labor

and Employment. Contractor shall fully cooperate with any investigation to determine if Contractor is in compliance with the provisions of C.R.S. § 8-17.5-101 et seq., which may include on-site inspections, reviewing proof of citizenship documentation of any person participating in the Work, or any other reasonable and necessary measures to determine the Contractor's compliance with such law.

9.4.1.6 In the event of a violation of the provisions of this Section 9.4 by Contractor, in addition to any other remedies Owner may have under the Contract, at law or in equity, Owner shall be entitled to terminate the Contract and/or recover from Contractor all of its direct and consequential damages resulting from such violation, including without limitation all costs, attorneys' fees, fines, penalties, and other losses incurred by Owner in connection with such violation.

9.4.2 Sole Proprietorships: If Contractor is a sole proprietor or individual, Contractor agrees to the following terms and shall execute a sworn or affirmed affidavit thereof from time to time as required by Owner:

I, [Contractor] as a sole proprietor/individual, hereby swear and affirm under penalty of perjury that I am [the Contractor] (i) a citizen of, or otherwise lawfully present in the United States pursuant to federal law, and the provisions of CRS § 24-76.5-101 et seq, (ii) and as proof have submitted one of the required forms of identification before the commencement of any work on this contract; and (iii) have or have attempted to verified that my Subcontractor(s), employee(s), and applicant(s) who is/(are) natural person eighteen years of age or older is/(are) lawfully present in the United States pursuant to CRS § 24-76.5-103(4).

If Contractor is an individual or sole proprietor, Contractor shall also produce for review and copying by Owner one of the following forms of identification before performing any Work: (i) a valid Colorado driver's license or a Colorado identification card; (ii) United States military card; (iii) a United States Coast Guard Merchant Mariner card; or (iv) a Native American tribal identification document.

9.5 General Compliance With Current Laws. Contractor shall comply with, and the Work shall conform to, all Current Laws. If Contractor observes that any of the Contract Documents are at variance with Current Laws in any respect, it shall promptly notify Architect and Owner in writing, and any necessary changes shall be adjusted by appropriate modification of the Contract Documents. If, during the performance of the Contract by Contractor, Contractor becomes aware of any change in Current Laws that are directly applicable to the Work from those in force as of the date hereof, Contractor shall give Architect and Owner written notice of such change promptly after Contractor becomes aware of the promulgation of such new law or regulation or interpretation thereof. Such notice shall include Contractor's estimate of the impact (if any) of such change on the Contract Sum, Required Substantial Completion Date and Required Final Completion Date. An Agreed Change reflecting any such impact, including an increase or decrease in the Contract Sum, if applicable, shall be made to account therefor. If Contractor performs any Work under any circumstances where it knew or should have known that such Work failed to comply with any Current Laws and failed to give notice thereof to Architect and Owner, Contractor shall correct such Work at its cost or pay Owner for the correction thereof.

Article 10. BONDS

10.1 Required Bond or Bonds. The Contractor shall furnish a contractor's performance and payment bond on forms supplied by the Owner, executed by a corporate bonding company licensed to transact such business in the State of Colorado and acceptable to the Owner, in the full amount of the Contract Sum (or, if the Agreement is a CMGC Agreement, the Guaranteed Maximum

Price). The bond shall contain terms that comply with all the requirements of C.R.S. § 38-26-105 and -106 and any greater requirements imposed by this Contract. If at any time a surety on such a bond becomes irresponsible or loses its right to do business in the State of Colorado, the Owner may require another surety acceptable to the Owner, which the Contractor shall furnish within ten (10) days after receipt of written notice to do so. The term of the performance bond shall commence on the effective date of the Contract and shall not be withdrawn until the end of the Warranty Period as specified herein unless the Owner, in its sole and absolute discretion, approves the substitution of a warranty bond during the Warranty Period.

Article 11. WARRANTY

- 11.1 Correction of Defective Work on Building and Infrastructure.** If, within the Warranty Period, any of the Work is found to be not in accordance with the requirements of the Contract Documents or is found to be defective in workmanship or materials, Contractor shall correct it promptly after receipt of written notice from Architect or Owner to do so unless Owner has previously expressly accepted such condition in writing. Deficiencies which impair the safety or habitability of a building shall be considered emergencies, and work to correct the same shall be commenced immediately upon notification of the deficiency and promptly, continuously and diligently pursued to completion. As used herein, (“**Warranty Period**”) shall mean the period of twenty-four (24) months after the date of Final Completion of the Work, as extended by terms of any longer applicable special warranty required by the Contract Documents.
- 11.2 Warranty Inspections.** Contractor, Owner and Architect shall make at least three (3) complete inspections of the Work after Final Completion. One such inspection shall be made approximately three (3) months after Final Completion of the Work, the second at twelve (12) months and the third at twenty-three (23) months after Final Completion. Contractor shall be responsible to coordinate such inspections. At each such inspection, Contractor and Architect shall thoroughly examine the Work to confirm that all portions thereof are in accordance with the Construction Documents.
- 11.3 Public Improvements.** If the Work includes any public improvements, Contractor shall correct all such portions of the Work which are found to be defective as required by the applicable governmental authorities for the acceptance into maintenance of such public improvements by such governmental authorities until the same have been accepted into maintenance by the applicable governmental authority and Owner has been released from responsibility for correcting defects or repairing damage to such public improvements; provided, however, that Contractor shall not be responsible for any damage thereto caused by the operations of Owner or its successors.
- 11.4 Self-Help.** If Contractor does not proceed with correction of nonconforming Work within a reasonable time after written notification from Architect or Owner, and in any event within fourteen (14) days (unless Owner in writing approves a longer period of time), Owner may correct it, including the removal and disposition of any portion thereof which Owner replaces in connection with such correction. Owner may dispose of any salvable portion of such removed materials in any manner Owner determines; provided that any proceeds from the disposition thereof shall be credited to Contractor’s obligations under this Section. Contractor shall promptly pay to Owner one hundred twenty-five percent (125%) of Owner’s out-of-pocket costs of correcting such Work.
- 11.5 Longer Warranties.** Extended warranties for such longer period(s) of time as may be prescribed by the terms of any applicable special guarantee(s) required by the Contract Documents shall be provided by the applicable manufacturer, vendor, or Subcontractor as required by the Contract Documents. Owner shall be required to perform routine and appropriate regular maintenance during the Warranty Period.

- 11.6 No Limitations Created.** Nothing contained in this Article 11 shall be construed to establish a period of limitation with respect to other obligations which Contractor might have under the Contract Documents. Establishment of the time periods specifically provided in this Article shall relate only to the obligations of Contractor specifically provided in this Article and shall have no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish Contractor's liability with respect to Contractor's obligations other than as specifically provided in this Article.
- 11.7 Survival.** The obligations of Contractor under this Article 11 shall survive acceptance of the Work under the Contract and termination of the Contract.

Article 12. INSURANCE; RISK OF LOSS

- 12.1 Contractor's Insurance – CGL, Auto, Workers' Compensation, Property.** Contractor shall maintain in force during the performance of all Work and all warranty work under the Contract the following insurance coverages:
- 12.1.1 Commercial General Liability Insurance, written on an "occurrence" form and not a "modified occurrence" or "claims made" form, covering bodily injury, property damage and personal injury with a limit of liability not less than \$1,000,000 combined single limit per occurrence and \$2,000,000 general aggregate. The aggregate limit of liability is to apply separately to the Contract. Such insurance coverage shall include (a) premises and operations, (b) products/completed operations, and (c) explosion, collapse and underground (XCU). All such coverage shall extend to all operations by or on behalf of Contractor (including those of any Subcontractor). Such policy shall provide that costs of defense are covered in addition to and not as part of the limits of liability.
- 12.1.2 Business automobile liability coverage for liability arising from any automobile (including owned, hired, and non-owned automobiles) with minimum limits of \$1,000,000 combined single limit each accident.
- 12.1.3 Workers' compensation insurance with at least the coverages and limits required by state law and including occupational disease coverage, and employer's liability insurance with minimum limits of \$1,000,000 bodily injury for each accident, \$1,000,000 per employee for disease, and \$1,000,000 disease aggregate.
- 12.1.4 Property insurance covering the full replacement cost of any property of Contractor that may be used in connection with the Work, including without limitation any property that may be brought on the Site.
- 12.1.5 Each Commercial General Liability policy and automobile liability policy shall include an Additional Insured Endorsement issued to all of the Owner Parties, with such additional insured coverage provided on a primary and non-contributory basis. The Additional Insured Endorsement to the Commercial General Liability policy shall include completed operations coverage.
- 12.1.6 Each policy carried by Contractor and its Subcontractors and Sub-subcontractors shall include a waiver of subrogation endorsement for the benefit of Owner Parties.
- 12.1.7 Umbrella or Excess Following Form Insurance with limits of liability not less than those provided on Exhibit A to the Agreement, providing excess commercial general liability, auto liability and employer's liability. Such umbrella or excess policy shall be endorsed to name the Owner Parties as additional insured on a primary and non-contributory basis.

12.2 Subcontractors and Sub-subcontractors. Unless otherwise agreed in writing by Owner, Contractor shall require each Subcontractor to maintain the same insurance coverages to be provided under Section 12.1 above except as to umbrella and excess liability coverage. Each liability policy the Contract Documents require to be carried by Contractor shall include coverage for liability arising out of the activities of Contractor's Subcontractors in the scope of their engagement as Subcontractors.

12.3 Builder's Risk.

12.3.1 Unless Owner elects at its sole option to obtain builder's risk insurance for the Project, Contractor shall purchase and maintain builder's risk insurance on the entire Work for the full insurable replacement cost of the Work, on a completed value basis, with permissible deduction of the cost of excavations, foundations below the lowest basement floor, underground flues, underground pipes, underground wiring, sidewalk, driveways, curbs and gutters, street improvements, and fences. Such coverage shall be in force before the commencement of Construction Work and shall remain in effect until Final Completion of the Project and include permission to occupy the Site. The builder's risk policy shall not include a coinsurance clause, and any deductible amounts under such insurance policy shall be the responsibility of Contractor. Such insurance shall insure against "all risk" of physical loss or damage including coverage for theft, vandalism, malicious mischief, collapse, debris removal (including demolition occasioned by enforcement of any applicable legal requirements), loss resulting from faulty workmanship, faulty materials or error in design, and offsite storage and transit exposures, and shall also cover reasonable compensation for any plans and specifications, services, and expenses required because of such insured loss.

12.3.2 The builder's risk policy shall name the Owner as the Insured, and any loss shall be payable to the Owner, as trustee, except to the extent that it may be necessary to permit payment of all or a portion of such insurance to a lessor or mortgagee as its interests may appear. Insurance for loss caused by flood, surface waters, and earthquake shall not be required unless otherwise provided in the Contract Documents.

12.3.3 Contractor shall provide Owner copies of documents evidencing the cost to Contractor of the insurance required by this Section 12.3. Owner may, at its option, directly obtain the insurance required by this Section 12.3, in which event (i) Contractor shall be named as an additional insured under such policy and (ii) if the Contract Sum included reimbursement of the costs of such coverage, it shall be reduced by the amount the Contractor would have had to pay for such coverage.

12.3.4 If Owner engages separate contractors to perform work in the Building, Owner may require the value of such third-party work to be included in the coverage under the builder's risk policy; provided, however, that Owner shall be responsible to reimburse Contractor for the incremental costs of such additional coverage and such reimbursement shall not be credited against the Contract Sum.

12.4 Pollution Coverage. If requested by Owner, Contractor shall purchase and maintain contractor's pollution liability coverage covering third-party injury and property damage claims, including cleanup costs incurred as a result of pollution conditions arising from Contractor's operations and completed operations. Such completed operations coverage shall remain in effect for no less than three (3) years following Final Completion. Such policy shall be in force and have an effective date before the commencement of Construction Work. The Owner Parties shall be named as an additional insured under such policy. The limits of such pollution liability coverage shall be at least \$1,000,000 per occurrence and in the aggregate, unless Exhibit A to the Agreement provides for higher limits. If Owner requests that Contractor carry such insurance, the

costs thereof shall be included in Soft Costs and the Contract Sum shall be increased if necessary to include such costs.

- 12.5 Certificates of Insurance.** A certificate of insurance reasonably satisfactory to Owner evidencing each policy to be maintained by Contractor pursuant to this Article or, at Owner's request, a copy of each such policy shall be delivered to Owner before the commencement of Work. Such certificates shall provide that such insurance will not be cancelled without thirty (30) days prior written notice to Owner (ten (10) days in the event of non-payment of premiums). Contractor shall provide certificates of insurance evidencing replacement or renewal policies that conform to the requirements of this Section 12.5 at least fifteen (15) days before Contractor's then existing policies expire and from time to time upon request of Owner. Upon request, Contractor shall provide Owner complete copies of the insurance policies required by the Contract Documents. Contractor shall obtain certificates of insurance and monitor policies of insurance maintained by Subcontractors as is necessary to assure that Subcontractors all carry the insurance required hereby.
- 12.6 Additional Insured Endorsements.** All "additional insured" coverage required under the Contract Documents shall be evidenced by proper endorsements to the respective policies of insurance. Identification of a party as "additional insured" on a certificate of insurance shall not satisfy Contractor's obligations to obtain such endorsements and furnish the same to Owner.
- 12.7 Other General Requirements.**
- 12.7.1 Each of the policies of insurance required by the Contract Documents shall, in addition to the provisions specifically required herein, include the minimum coverages, terms and conditions of Insurance Services Office forms of policies and endorsements.
- 12.7.2 All insurance policies required by this Article 12 shall be written by companies licensed to write insurance in Colorado with an A.M. Best rating of at least A-/VIII and otherwise reasonably satisfactory to Owner.
- 12.7.3 All insurance coverage carried by Contractor shall be primary, and any insurance coverage carried by Owner Parties shall be only excess coverage.
- 12.8 Failure to Insure.** In the event Contractor or any Subcontractor fails to maintain any insurance required by this Article 7, such failure shall be a default of the Contract, and, in addition to Owner's other remedies under the Contract, at law or in equity, Owner may procure such additional insurance for the benefit of itself and/or Contractor as Owner reasonably deems necessary to protect its interests and Contractor shall be liable to reimburse Owner for one hundred fifteen percent (115%) of its costs of such insurance.
- 12.9 Waiver of Subrogation.** Owner waives all rights against Contractor and its Subcontractors, agents and employees, and Contractor waives all rights against the Owner Parties, for damages caused by perils covered by property insurance obtained pursuant to the Contract or other applicable property insurance to the extent of such coverage, except such rights as they have to proceeds of such insurance. Contractor shall require all Subcontractors to provide similar waivers in writing each in favor of all other parties identified in this Section 12.9. Owner and Contractor shall cause their respective insurers to waive all rights of subrogation, and the policies shall provide such waivers of subrogation by endorsement if an endorsement is required.

Article 13. INDEMNIFICATION

- 13.1 Contractor's Indemnification.** Contractor shall indemnify and hold harmless the Owner Parties from and against claims, damages, losses and expenses, including reasonable attorneys' fees

and costs, arising out of or resulting from performance of the Work (collectively and individually, "Claims"), provided, however, that Contractor shall be obligated to indemnify and defend Owner Parties from and against Claims arising out of death or bodily injury to persons or damage to property only to the extent of the degree or percentage of negligence or fault attributable to the acts or omissions of Contractor, a Subcontractor, a Sub-subcontractor, anyone directly or indirectly employed or engaged by them or anyone for whose acts they may be liable. Such obligation shall not be construed to negate, abridge, or reduce other rights to obligations otherwise undertaken by Contractor pursuant to the terms of this Contract. In the event that any term or provision of this paragraph is void under applicable law, the terms and provisions of this paragraph shall be limited to the extent necessary to render this paragraph valid, and as so limited, the terms and provisions of this paragraph shall be given full force and effect.

13.2 Limitations Not Applicable. In claims against any person or entity indemnified under this Article 13 by an employee of Contractor, a Subcontractor, Sub-subcontractor, Supplier, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under this Article 13 shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for Contractor or a Subcontractor, Sub-subcontractor, or Supplier under worker's or workmen's compensation acts, disability benefit acts or other employee benefit acts.

13.3 Employee Benefits. To the fullest extent permitted by law, Contractor shall indemnify, defend (with counsel acceptable to Owner) and hold harmless the Owner Parties from any Claims with respect to any Employee Benefits for the benefit of Contractor and/or any of its employees, Subconsultants, agents, or anyone else acting on behalf of or at the request of the Contractor, that may be asserted against or imposed on the Owner Parties (except to the extent such Claims arise from a separate direct relationship between the claimant and an Owner Party unrelated to the Services or the Contract). Contractor shall reimburse the Owner for any award, judgment or fine against the Owner based on any claim that has as an element the proposition that Contractor or any of its employees, Subconsultants, agents, or anyone else acting on behalf of or at the request of the Contractor became entitled to Employee Benefits by virtue of activities undertaken in connection with the provision of Services under the Contract.

Article 14. DEFAULTS, REMEDIES AND TERMINATION

14.1 Default by Contractor. Time is of the essence of Contractor's obligations under the Contract. Contractor shall be in default under the Contract upon the occurrence of any of the following:

14.1.1 Contractor fails, except in cases of Excused Delay, to commence the Work in accordance with the Milestone Schedule.

14.1.2 Contractor fails, except in cases of Excused Delay, to make progress on the Work substantially in accordance with the Milestone Schedule.

14.1.3 Contractor fails, except in cases of Excused Delay, to prosecute the Work to Substantial Completion and Final Completion in a diligent, efficient, workmanlike, skillful, and careful manner in accordance with the provisions of the Contract Documents.

14.1.4 Contractor fails, except in cases of Excused Delay, to supply an adequate amount of properly skilled workers, materials, or equipment to complete the Work in accordance with the requirements of the Contract Documents.

14.1.5 Contractor ceases or suspends Work other than in accordance with the express terms of the Contract Documents.

- 14.1.6 Contractor fails to make payment to Subcontractors, Suppliers, or others in accordance with Contractor's agreements with such parties or the provisions of the Contract Documents, whichever is more stringent.
- 14.1.7 Contractor fails to comply with any Current Laws.
- 14.1.8 Contractor fails to comply with any other material or substantial provision of the Contract Documents.

If a default continues uncured for seventy-two hours (or as otherwise agreed to by Owner in writing) after Owner gives notice of such default to Contractor, such failure to cure shall be deemed an "**Event of Default**" entitling Owner to exercise its remedies provided in Section 14.2 below. In addition, if Contractor becomes insolvent, makes an assignment for the benefit of creditors, or becomes the subject of a bankruptcy proceeding (unless the same is an involuntary proceeding against Contractor and is dismissed within forty-five (45) days after it has been commenced), the same shall also be an Event of Default.

14.2 Owner's Remedies.

- 14.2.1 Upon the occurrence of an Event of Default, Owner may, in addition to any other remedy which may be provided in the Contract Documents or which is otherwise available at law or in equity, terminate the engagement of Contractor made under the Contract and may (i) take possession of the Site and of all materials, equipment, tools, and construction equipment and machinery thereon owned by Contractor; (ii) accept assignment of such subcontracts and contracts with Supplier as Owner may from time to time elect; and (iii) finish the Work by whatever reasonable method Owner may deem expedient. Any such act by Owner shall not be deemed a waiver of any right or remedy of Owner, and Owner shall have all rights and remedies available at law or in equity.
- 14.2.2 If after exercising any such remedy, the reasonable cost to Owner of the performance of the balance of the Work is in excess of that part of the Contract Sum that has not theretofore been paid to Contractor hereunder, Contractor shall be liable for and shall reimburse Owner for such excess within thirty (30) days of its receipt from Owner of an invoice detailing such excess cost.
- 14.2.3 If Owner terminates the Contract as permitted by this Section 14.2, Contractor shall not be entitled to receive any further payment hereunder; provided that, if Owner is able to have the Project finished for less than the Contract Sum, Owner shall pay to Contractor the amount, if any, necessary to pay Subcontractors of Contractor for the Work they performed in a satisfactory manner prior to such termination, but only to the extent that such payment will not cause Owner to have expended, for all costs of the Project, an amount in excess of the Contract Sum.
- 14.2.4 The remedies provided to Owner pursuant to this Article shall be in addition to all other remedies of any kind and nature which Owner may have, either at law or in equity, for any breach hereof or failure to perform by Contractor, including the liquidated damages provided herein. All remedies of Owner shall be cumulative, and the exercise of one or more remedies by Owner hereunder shall not preclude the simultaneous exercise or subsequent exercise of other or additional remedies.

14.3 Default by Owner. Time is of the essence in Owner's performance of its obligations to Contractor hereunder. Owner shall be in default of its obligations under the Contract upon the occurrence of any of the following:

14.3.1 Failure to pay Contractor any Progress Payment when it is due (not including any payment or portion thereof to which Owner has timely made objection in the manner provided in the Contract Documents).

14.3.2 Failure to perform any other material obligation under the Contract Documents in the time permitted thereby.

Owner's failure to cure any such default within thirty (30) days after receiving written notice thereof from Contractor with respect to a non-monetary default (or so long thereafter as Owner is using commercially reasonable efforts to cure such default) or within fifteen (15) business days after receiving notice from Contractor of failure to make a Progress Payment (not including any payment or portion thereof to which Owner has timely made objection in the manner provided in the General Conditions of the Contract) shall be an Event of Default by Owner.

14.4 Contractor's Remedies. In the event that an Event of Default by Owner occurs and is then continuing, (i) Contractor may cease all or any portion of the Work, and Owner shall be responsible for all increased costs arising out of such delay, which delay shall be an Owner Delay, but only to the extent that the Work is actually delayed as is necessary to be an Owner Delay under Section 13.2 of the General Conditions of the Contract or (ii) in the alternative, Contractor may terminate the Contract, remove any materials, equipment, and tools from the Site, and recover from Owner payment for all Work executed and any loss or damage sustained by Contractor by reason of the termination; provided that in no event shall Contractor be entitled to recover from Owner more than the remainder obtained when the (a) sum of (i) the costs of completing the Work Contractor avoids by the termination plus (ii) the amounts already paid by Owner to Contractor hereunder are subtracted from (b) the Contract Sum.

14.5 Attorneys' Fees. In the event any dispute related to the Contract is made the subject of litigation, the party prevailing on the more substantial part of its claims and defenses in such litigation shall be entitled to recover its attorneys' fees and costs reasonably incurred in connection with such litigation.

14.6 Suspension by Owner for Convenience. Owner may, without cause, order Contractor in writing to suspend, delay, or interrupt the Work in whole or in part for such period of time as Owner may determine. An equitable adjustment by Agreed Change shall be made for increases in the Contract Sum, Required Substantial Completion Date and Required Final Completion Date on account of any such suspension, delay or interruption. If the suspension of the Work by Owner for convenience exceeds ninety (90) days, Contractor may terminate the Contract, and Owner shall pay Contractor in accordance with the provisions of Section 14.7. During any period of suspension, Contractor shall store all materials to prevent them from becoming damaged in any way or becoming an obstruction, and shall take all appropriate precautions to prevent damage to or deterioration of the Work, provide suitable drainage and erect temporary structures where necessary, provided that Contractor shall first notify the Owner and Architect of the measures the Contractor proposes to take and the anticipated costs thereof.

14.7 Termination by Owner Without Cause. For purposes hereof, "**Commencement of Construction**" shall be deemed to have occurred on the earliest of (i) date on which Contractor, with the consent of Owner, moves the first equipment onto the Site, (ii) the date on which Contractor, with the consent of Owner, makes an order for materials that cannot be canceled without payment of a cancellation fee, loss or deposit, or similar cost, or (iii) otherwise, with the consent of Owner, takes action to commence construction that cannot be terminated without cost.

14.7.1 Prior to Commencement of Construction. If the Agreement is a CMGC Agreement, Owner may at any time prior to Commencement of Construction, at will and without cause, terminate the Contract by notice to Contractor. In the event of such termination,

Contractor shall immediately stop the Pre-Construction Work, and, to the extent Owner has not already paid such amounts to Contractor, Owner shall pay Contractor the portion of the Pre-Construction Fee applicable to Pre-Construction Work already performed, including an equitable portion of the installment of the Pre-Construction Fee applicable to the then-current Design Phase based on the proportion of the Pre-Construction Work for that Design Phase (including consultations) that has been completed.

14.7.2 After Commencement of Construction.

14.7.2.1 Owner may, at any time on or after Commencement of Construction, at will and without cause, terminate all or any part of the Work and any subcontract or any contract with a Supplier pertaining to the same by giving written notice to Contractor specifying the part of the Work or subcontract or any contract with a supplier to be terminated and the effective date of the termination. In case of a termination of a portion of the Work, Owner will execute an Agreed Change making any required adjustment to the Required Substantial Completion Date, Required Final Completion Date and/or the Contract Sum necessitated by such termination. Contractor shall submit its claim for the amounts of such adjustments in writing within ten (10) days after the first to occur of the resumption of the Work or the termination of the Contract. For the remainder of the Work, if any, the Contract Documents shall remain in full force and effect. Contractor shall continue to prosecute the Work not terminated, if any.

14.7.2.2 If any part or all of the Work is so terminated or if Contractor terminates the Contract pursuant to Section 14.6, Contractor shall be entitled to payment for: (i) Work properly executed in accordance with the Contract Documents; (ii) the full amount of Soft Costs incurred through the date of termination; (iii) the portion of the Contractor Fee applicable to the portion of the Work completed; (iv) costs directly related to the termination of the Contract or to Work thereafter performed by Contractor in terminating such Work, including costs of demobilization; and (v) materials specially fabricated for the Work prior to the time when the Contractor gives or receives notice of such termination and not incorporated in the Work prior to termination.

14.7.2.3 If any materials specially fabricated for the Work are not fully prepared when the Contractor gives or receives notice of termination of the Agreement, Contractor shall, immediately upon giving or receiving such notice, (i) notify the applicable Suppliers to stop work and wait for further instructions, and (ii) notify Owner and Architect that such materials are partially fabricated and that the suppliers thereof are awaiting further instructions. The Owner shall, within ten (10) days from the date it receives Contractor's notice, notify Contractor whether to have the work on such materials or other items completed. Contractor shall cancel all orders for materials or other items which the Owner does not wish to have completed. Contractor shall make a settlement with each such material supplier reasonably satisfactory to Owner, the costs of which shall be reimbursed by the Owner.

14.7.2.4 Owner shall be entitled to purchase from the Contractor any of the materials and other items obtained by the Contractor for the Work, but not incorporated in the work prior to termination, for the cost thereof to the Contractor.

Article 15. CONCEALED CONDITIONS

15.1 Concealed Conditions.

- 15.1.1 In the event Contractor encounters subsurface or otherwise concealed physical conditions that differ materially from those conditions reasonably inferable from observations of the exposed surfaces of the Site and reports, surveys, assessments, record drawings and other information furnished by Owner or obtained by Contractor, Contractor shall provide Architect and Owner notice thereof within two (2) business days after first discovering the same and shall suspend those portions of the Work that conflict with such conditions until receipt of further directions from Owner.
- 15.1.2 Contractor and Owner shall inspect and evaluate such conditions, and Owner shall cause the Architect, if necessary, to prepare appropriate supplemental drawings or instructions to address or accommodate the conditions discovered.
- 15.1.3 Delay resulting from the suspension of Work pending the investigation of unforeseen concealed conditions shall be an Owner Delay, but only to the extent that the same causes actual delay in the critical path to complete the Work that satisfies all the requirements necessary to be an Owner Delay under Section 3.4.1 and all the requirements of Section 15.1.5 below.
- 15.1.4 If the actions necessary to address such conditions of the Site increase the Cost of Work or adversely impact the critical path to completion of the Work, Contractor may request that an Agreed Change or Change Directive be issued for changes in the Work reflected in the supplemental drawings or instructions prepared to address such conditions, subject to the provisions of Section 15.1.5 below.
- 15.1.5 **Costs.**
- 15.1.5.1 Notwithstanding anything to the contrary provided herein, Contractor shall not be entitled to any increase in the Contract Sum or extension of the Milestone Schedule, nor shall any Owner Delay be deemed to have occurred, on account of any condition of the Site that was indicated in or reasonably inferable from (i) observations of the exposed surfaces of the Site and reports, surveys, assessments, record drawings and other information furnished by Owner or obtained by Contractor, (ii) a thorough inspection of the Site prior to the commencement of the Work (regardless of whether such thorough inspection was actually conducted), or (iii) other information and documents furnished to Contractor by Owner or others.
- 15.1.5.2 If the Agreement is a GMGC Agreement, increases in the Cost of Work (and any associated Construction Fee and General Conditions fee, if applicable) in connection with any Agreed Change or Change Directive under Section 15.1.4 shall be charged to the Contingency, and an increase in the Guaranteed Maximum Price shall be allowed, if at all, only to the extent that such costs exceed the balance of the Contingency.
- 15.1.6 Any dispute as to whether Contractor is entitled to receive an increase in the Contract Sum or extension of the Milestone Schedule on account of concealed conditions of the Site shall be a Dispute and shall, at the request of either Contractor or Owner, be submitted to Dispute Resolution.

Article 16. HAZARDOUS SUBSTANCES

- 16.1 Hazardous Substances.** “Hazardous Substances” include any substance identified as a hazardous substance pursuant to any federal, state or local law or regulation regulating substances by reason of threats posed to public health and safety, including the Comprehensive Environmental Response, Compensation and Liability Act, the Resource Conservation and Recovery Act, the Emergency Planning and Community Right-to-Know Act of 1986, the Hazardous Substances Transportation Act, the Solid Waste Disposal Act, the Clean Water Act, the Clean Air Act, the Toxic Substances Control Act, the Safe Drinking Water Act, the Occupational Safety and Health Act, and the Asbestos Hazard Emergency Response Act, all as amended.
- 16.2 Existing Facilities – Hazardous Substances May Exist.** Contractor acknowledges that most existing structures owned or operated by Owner contain asbestos-containing materials, and the Site may also contain other Hazardous Substances. Contractor and any Subcontractors, Sub-subcontractors or other personnel who may come into contact with asbestos-containing materials shall review and become familiar with Owner’s plan under the Asbestos Hazard Emergency Response Act, currently titled the “Denver Public Schools General Asbestos Management Plan” and the AHERA Asbestos Management Plan and Hazardous Materials Information book for each existing facility comprising part of the Project, as each may be revised from time to time. All persons acting for Contractor under the Contract shall be responsible to perform the responsibilities of “Vendors” as defined in those Plans.
- 16.3 No Introduction of Hazardous Substances.** Contractor, its contractors, its Subcontractors, its Sub-subcontractors, its Suppliers, and their respective agents, representatives and employees shall not introduce or cause the introduction of Hazardous Substances to the Project. Except as provided below as to Ordinary Course Materials, in the event that Contractor, its contractors, its Subcontractors, its Suppliers, or their respective agents, representatives and employees introduce or cause the introduction of Hazardous Substances to the Project, Contractor shall pay for removal of all such substances and shall indemnify Owner and its successors as owners of the Property for all liability resulting from the introduction of such Hazardous Substances to the Project.
- 16.4 Suspected Hazardous Substances.** Contractor acknowledges that other Hazardous Substances may exist in building materials, soils, or equipment used on the Site. Contractor shall not be primarily responsible to identify Hazardous Substances existing on the Site; provided that Contractor shall be responsible to comply with all recommendations and requirements of environmental consultants furnished to Contractor in writing. Except as provided above and except for Ordinary Course Materials, if Contractor encounters what Contractor reasonably believes may be Hazardous Substances, Contractor shall immediately stop Work in the area affected and immediately report the condition to Architect and Owner in writing. If, in fact, the materials are Hazardous Substances, the Work in the affected area shall not thereafter be resumed, except by written agreement of Owner and Contractor, until the Hazardous Substances have been removed or rendered safe by Owner in accordance with all applicable laws at Owner’s expense, and Owner has provided reasonable evidence thereof to Contractor. The Work in the affected area shall be resumed in the absence of Hazardous Substances, when any Hazardous Substances have been rendered harmless, or when the conditions in the preceding sentence have been satisfied. Unless such materials were introduced to the Project by Contractor or its contractors, Subcontractors, Sub-subcontractors, Suppliers, or their respective agents, representatives and employees, Owner shall be responsible for all reasonable costs related to any testing, removal, encapsulation, or remediation of any such substances or materials, and any additional cost of the Work arising out of any delay in the Work caused thereby. Except as to such materials introduced to the Project by Contractor or its contractors, Subcontractors, Sub-subcontractors, Suppliers, or their respective agents, representatives and employees, any delays

arising out of such testing, removal, encapsulation, or remediation shall be an Owner Delay, but only to the extent that the same causes actual delay in the Work that satisfies all the requirements necessary to be an Owner Delay under Section 3.4.1; provided, however, that if the Agreement is a GMGC Agreement, any increases in the Cost of Work (and any associated Construction Fee and General Conditions fee, if applicable) in connection with any such Owner Delay shall be charged to the Contingency, and an increase in the Guaranteed Maximum Price shall be allowed, if at all, only to the extent that such amounts exceed the balance of the Contingency.

- 16.5 Ordinary Course Materials.** Nothing contained herein shall be deemed to preclude Contractor from using and bringing onto the Property materials and substances (which are otherwise Hazardous Substances) used in the ordinary course of commercial construction in quantities typically and safely used for such purposes (“**Ordinary Course Materials**”). Contractor shall use all Ordinary Course Materials in accordance with all Current Laws and shall make sure that none of the Ordinary Course Materials are released or otherwise permitted to contaminate the Property or render the Property contaminated. Contractor shall defend and indemnify Owner against any claim, cost, loss, or damage resulting from the use of the Ordinary Course Materials in connection with the Project or resulting from the introduction of Hazardous Substances onto the Property in a manner not specifically permitted hereby. In the event Contractor recognizes any improper handling or storage of Hazardous Substances on the Site, including Ordinary Course Materials, or observes circumstances which contractor actually knows may result in the release or discharge of Hazardous Substances, whether or not by someone for whose acts Contractor is responsible, Contractor shall immediately notify Owner thereof.

Article 17. ROYALTIES AND PATENTS

- 17.1 General Requirements.** Contractor shall pay all royalties and license fees, and such costs shall be part of the Cost of Work. Contractor shall, at its own cost and not as part of the Cost of Work, defend all suits or claims for infringement of any patent rights relating to equipment or materials incorporated in the Work and shall indemnify and save Owner harmless from loss on account thereof, except that Owner shall be responsible for all such loss when a particular design process or the product of a particular manufacturer or manufacturers is specified by Owner; provided that, if Contractor has been notified or otherwise has reason to know that the use of a required design, process, or product is an infringement of a patent, Contractor shall be responsible for such loss, at its own cost and not as part of the Cost of Work, unless such information is promptly furnished to Architect and Owner.

Article 18. DRAWINGS, DETAIL AND INSTRUCTIONS

- 18.1 Clarifications and Additional Instructions.** In the event Contractor observes that the Construction Documents contain ambiguities or omissions, or are inconsistent with existing conditions on the Site, Contractor shall promptly submit to Architect a written request for clarification or additional instructions. Contractor shall do no Construction Work without adequate drawings and instructions describing the Work in sufficient detail for the proper execution thereof.
- 18.2 Details Schedule.** If detail drawings or other instructions are to be prepared by Architect during the course of the Work, Contractor and Architect shall jointly prepare a schedule for the Architect to provide such Work Product, and Contractor shall incorporate such schedule into the Project Schedule.
- 18.3 Copies of Construction Documents.** Unless otherwise provided in the Contract Documents, Architect will furnish the Contractor with all copies of Construction Documents reasonably necessary for the execution of the Work.

18.4 Ownership of Work Product. Contractor acknowledges that the Work Product and the copyright interest therein are owned either by Architect or by Owner, in accordance with the terms of the agreement between Architect and Owner. Contractor shall not be entitled to use the Work Product in connection with any construction other than the Project, and upon the completion of the Work or the termination of the Contract, Contractor shall return to Architect, at its request, all copies of the Work Product except one (1) signed record set of Construction Documents. Any models shall be the property of the Owner.

Article 19. ROLE OF THE ARCHITECT

19.1 Limited Agent. Architect is the agent of the Owner only to the extent provided in the Contract Documents and Architect's agreement with Owner. When in special instances the Architect is authorized to act on Owner's behalf, the Architect shall, upon request, provide the Contractor copies of the documents that establish such authority.

19.2 Primary Interpreter of Construction Documents.

19.2.1 The Architect shall be the primary interpreter of the meaning and intent of the Construction Documents and shall be, in the first instance, the judge of the performance of the Contract. Architect will visit the site at appropriate intervals to become familiar with its progress and quality and to determine in general if the Work is being performed in such a manner that it will, when fully completed, be in accordance with the Contract Documents.

19.2.2 Architect shall, in a timely manner, evaluate and issue written determinations resolving any claims or disputes submitted to the Architect for review under the Contract. Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents. The Architect's decisions on matters relating to aesthetic effect shall be final if consistent with the intent expressed in the Contract Documents. In exercising its authority to make such determinations, Architect shall exercise independent professional judgment based on the Contract Documents and shall not favor Contractor or Owner. All such determinations shall be subject to judicial review, provided, however, that any matters designated as Disputes under the Contract shall be submitted to Dispute Resolution in accordance with the Agreement before being made the subject of litigation unless the Agreement specifically provides otherwise.

19.3 Communications. Contractor shall furnish both Owner and Architect copies of all notices Contractor gives to either Architect or Owner under the Contract relating to Applications for Payment, Change Directives, Proposed Changes, Change Orders, Progress Payments, or claims for adjustment in the Contract Sum, Required Substantial Completion Date or Required Final Completion Date. Such duplicate notice shall also be given as to other matters requested in writing by Owner or Architect.

Article 20. SUBMITTALS

20.1 Schedule of Submittals. Within thirty (30) days after the date of this Contract, Contractor and Architect shall jointly prepare a schedule for submittals of shop drawings, samples, schedules and other submittals to be made by the Contractor, the review thereof by Architect, and responses and resubmittals by Contractor based on the Architect's review. Contractor shall incorporate such schedule into the Project Schedule.

20.2 Scope of Architect's Review. Architect shall review Contractor's submittals of shop drawings, samples, schedules and other documents related to items to be incorporated in the Work for aesthetic effect. Contractor shall be responsible to ensure that such submittals conform to the

Contract Documents, and the approval of such submittals by Architect shall not relieve the Contractor from responsibility for any deviation of such submittals from the Contract Documents unless the Contractor gives the Architect specific written notice of such deviation together with such submittal, nor shall it relieve the Contractor from responsibility for errors and omissions contained in such submittals.

20.3 Review Process. The review of Contractor's submittals shall be conducted in accordance with the provisions of the specifications contained in the Construction Documents. Such specifications will be based on the Standards.

Article 21. NOTICES

21.1 How Notice May Be Given. All notices required or permitted to be given under the Contract shall be in writing and shall be delivered by (i) certified or registered mail, postage prepaid, return receipt requested, (ii) commercial courier, (iii) hand delivery, or (iv) successful and confirmed facsimile transmission. All such notices shall be delivered to the parties at the addresses provided in the Agreement or at such other address as Contractor, Owner or Architect may determine for itself by notice given to the other parties. Each notice shall be deemed effective when actually delivered to the address for the party or delivery at such address is tendered and refused or, if the party has multiple addresses, when either actually delivered to, or delivery is tendered and refused at, each of the addresses for the party. Notwithstanding anything to the contrary herein, meeting notes and minutes prepared by Contractor shall not constitute notice of any fact regarding which notice is permitted or required to be given under the Contract, regardless of how such notes and minutes are delivered.

Article 22. INDEPENDENT CONTRACTOR.

22.1 Status. The parties intend that Contractor shall have the status of an independent contractor, and the Contract Documents shall not be construed to render Contractor or any employee, Subcontractor or Sub-subcontractor of Contractor, or any of their employees, officers or agents, an employee or partner of Owner.

22.2 Employee Benefits. Neither Contractor nor any of its employees, officers, agents, Subcontractors, Sub-subcontractors, or other contractors or consultants shall be entitled to any employee benefits from the District, including, but not limited to, any employer withholding or liability for any of the following: taxes; FICA contributions; other Social Security, Medicare or Medicaid contributions or withholding; medical or disability insurance; vacation or leave; pension contributions; unemployment insurance or worker's compensation insurance (collectively, "**Employee Benefits**"). Contractor shall be responsible to pay all taxes due on account of any payments to Contractor by Owner under the Contract. Except to the extent, if any, that such a waiver and release may be expressly prohibited by applicable laws, Contractor waives and releases all claims against Owner for any Employee Benefits.

Article 23. NO WAIVER

23.1 No Waiver. No inspection by the Architect or any other person acting on the Owner's behalf, nor any order, measurement, estimate or certificate by the Architect, nor any order by the Owner for the payment of money, nor any payment for or acceptance of any Work, nor any extension of time, nor any possession taken by the Owner, shall operate as a waiver of any right of Owner arising out of or related to the Contract. No waiver of any breach of the Contract shall be construed as a waiver of any other or subsequent breach thereof.

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DENVER PUBLIC SCHOOLS

**SCHOOL DISTRICT NO. 1 IN THE CITY AND COUNTY OF DENVER
AND STATE OF COLORADO**



SPECIFICATIONS

SECTION 00300 – MOVING AND STAGING FOR CONSTRUCTION

PART 1 GENERAL GUIDELINES

- A. This standard pertains to moving, staging, packing, and protecting building contents as necessary in order to accommodate construction and remodeling activities. Items discussed in this standard include, but are not limited to, the following:
 - 1. Furniture & Equipment
 - 2. Shelving Units, Books, Files, & Cabinets
 - 3. Technology Equipment
 - 4. Personal Items
 - 5. Hallways, Lockers, & Bulletin Boards
 - 6. Loose Floor Rugs, Pets, & Plants
 - 7. Libraries
 - 8. Kitchens
 - 9. Boxes
- B. It is the responsibility of the DPS Project Manager to coordinate timelines, deadlines, and project-specific requirements with principals, site-based managers, and building staff.
- C. The Architect/Engineer shall prepare moving and staging instructions for the Contractor in order to address building contents.
- D. Building staff may not employ the Contractor for moving/staging purposes without permission from DPS Project Manager. The Contractor will assume any risk and liability by performing work in this manner.

PART 2 PRODUCTS

- A. No standard.

PART 3 EXECUTION

- A. Furniture & Equipment
 - 1. All contents shall be removed from desks/drawers and either packed into boxes or taken home by staff.
 - 2. Desks or other equipment may have to be moved; Contractor to coordinate moving and staging activities with custodial staff.
 - a) Both building staff and Contractor shall document and note any damage to furniture/equipment prior to construction.
 - 3. Contractor shall label, with appropriate room number, any furniture or equipment staged outside of classroom.
 - a) If Contractor removes items from any room, Contractor shall return items to their appropriate location upon completion of work.
 - b) Contractor shall take care so as to not label items in such a manner that damages the items.
 - 4. Contractor is not responsible for loose items left in or on desks.
 - 5. Copy machines: The DPS PM shall coordinate with IKON, 720-423-3411.
 - 6. Vending machines: DPS PM shall coordinate with Enterprise Management, 720-423-5600 (2 to 4 weeks in advance).
 - 7. Phones: Staff to label and leave plugged in.
- B. Shelving Units, Books, Files, & Cabinets
 - 1. Building staff to lock/secure any items left inside built-in cabinets, except in cases when cabinet interiors are to be refinished or reconstructed.
 - a) Items/books left inside built-in cabinets (non-lockable) shall be inventoried and protected with plastic by building staff.
 - 2. Portable file cabinets: May remain full.
 - 3. Portable standing supply cabinets: Need to be emptied by building staff.
 - 4. Portable shelving units: Building staff shall empty, box contents, and protect units with plastic.
 - 5. Building staff shall remove and box all items from tops of cabinets, and any/all other work surfaces.
 - 6. Confidential Files: Building staff shall box and label these files and place in pre-designated storage area determined by DPS PM.

SECTION 00300 – MOVING AND STAGING FOR CONSTRUCTION

- C. Technology Equipment
 - 1. Building staff shall label computers and peripheral equipment with room number & teacher/staff name; as items will likely be separated.
 - a) Label each device: CPU, monitor, etc.
 - b) Building staff shall place peripheral equipment (keyboard, mouse, cords, etc.) into labeled plastic bag.
 - i) Building staff must furnish plastic bags.
 - 2. Building staff shall dismantle equipment and move to pre-designated, securable storage area. Custodial staff and Contractors are not to move this equipment.
- D. Personal Items
 - 1. As a general rule, items that are not securely stored or placed in boxes should be taken home by building staff. There is no guarantee that building contents will remain secure. It is not normally possible to negotiate replacement of items that may have been lost or damaged during construction.
- E. Hallways, Lockers, and Bulletin Boards
 - 1. Building staff need to remove everything from hallway/classroom walls, bulletin boards, and anything hanging from/attached to ceilings.
 - 2. Building staff must ensure that all lockers are completely empty and clear of books, supplies, labels, stickers, etc.
- F. Loose Floor Rugs, Pets, and Plants
 - 1. Without question, building staff must remove all pets from the premises.
 - 2. Plants shall be removed from the building.
 - 3. Floor rugs may be left in place; the Contractor shall move/protect rugs as necessary.
- G. Libraries
 - 1. The preference of DPS Library Services is for books to be left in place and covered with plastic by the Contractor.
 - 2. If books must be moved, the Contractor shall.
 - a) Create a map of original book locations.
 - b) Provide large mobile wooden book carts.
 - c) Remove books from shelves.
 - d) Place on carts in the same order taken from shelves.
 - 3. Contractor shall wrap book carts completely in plastic.
 - 4. Book carts shall be placed in a secure location.
 - 5. Contractor shall return books to shelves in the correct order.
 - 6. Under no circumstances shall librarians be asked to box up or re-shelve library book collections.
 - 7. If ANY metal shelving needs to be moved, Contractor shall contract with a qualified metal library shelving subcontractor to have the shelving dismantled, moved, and re-constructed. Books should be handled per item B.
 - 8. Library circulation desks often need special care. Qualified movers may be needed to handle circulation desk moves.
- H. Kitchens
 - 1. Food Services staff generally ends the school year later, and starts the year sooner than rest of building staff. DPS PM to coordinate/communicate these dates to the Contractor.
 - 2. Food Services staff to remove all perishables from kitchen area.
 - 3. Food Services staff and Contractor, together, are to document the working condition and appearance of kitchen equipment prior to construction.
 - 4. Kitchen equipment is to be dismantled and moved only by appropriately-licensed contractors.
- I. Boxes
 - 1. Building staff must box everything that will not be safe from flooring work (off of floor) painting (off of walls and ceilings, exposed work surfaces, and tops of furniture), and other areas of remodeling indicated by the DPS PM.

SECTION 00300 – MOVING AND STAGING FOR CONSTRUCTION

2. The Contractor shall provide moving boxes, labels, and tape in sufficient quantity. DPS PM will assist with coordinating timeline.
 3. Boxes shall be closed and taped shut. Nothing may protrude from closed boxes.
 4. Boxes should be labeled with room number, staff name, and contents of box.
 5. Building staff should place boxes in center of room, unless instructed otherwise.
- J. Building staff must dispose of trash resulting from packing.
- K. Custodial staff must be allowed to perform their normal cleaning activities during moving, staging, and construction.
- L. Custodial staff shall not perform Contractor's required cleaning, trash disposal, moving, and/or staging activities.
1. Contractor shall not use DPS equipment/supplies for their required cleaning, trash disposal, moving, and/or staging activities.
- M. Emergency egress shall not be blocked in any way.
- N. Construction zones are dangerous and, therefore, off limits during construction periods.
1. Contractor is responsible for security of construction area.
- O. Storage containers may be required, and shall be provided by Contractor.
1. Contractor is responsible for protecting asphalt from damage if storage containers are needed.
- P. Each project and school may require supplemental instructions to this standard. These instructions, when applicable, are to be incorporated into the contract documents by the project architect.

END OF SECTION 00300

SECTION 01010 – SUMMARY OF WORK

PART 1 GENERAL

1.01 WORK COVERED BY CONTRACT DOCUMENTS

- A. Work for this project includes demolition, materials, labor, transportation, security, temporary construction and other items identified in, or reasonably inferable from the Construction Drawings and Project Manual for:

Project Location: 3051 South Elm Street, Denver, CO 80222
Owner: Denver Public Schools, 900 Grant Street, Denver, CO 80203

1.02 WORK SEQUENCE

- A. Sequence and schedule shall be established by the Contractor to achieve completion dates as specified elsewhere. Critical work sequences and related scheduling requirements are detailed in Section 01310 – Progress Schedules. The Contractor's work plan and schedule shall include the activities and restrictions specified in Section 01310 and other specification sections.

1.03 USE OF PREMISES & SECURITY

- A. Areas in the vicinity of the building will be designated by the DPS Project Manager for the purposes of Contractor staging, stockpiling, and vehicle access.
- B. No portion of the site may be used by the Contractor without prior approval by the DPS Project Manager.
- C. Contractor personnel are prohibited from building interiors except as required to execute specific work indicated on the drawings.
- D. The Contractor is prohibited from utilizing the building's computers, phones and/or internet access.
- E. Toilet facilities and service sinks in the buildings are not to be used by the Contractor, Subcontractors or their personnel, or for cleaning tools, or for disposing of construction waste materials.
- F. Building keys will not be made available to the Contractor. Access into and throughout the building will be arranged through the DPS Project Manager.
- G. Protect existing property from unauthorized access to building interiors, roofs, etc. No temporary work or storage of materials shall compromise building security.
- H. No temporary work shall compromise structural integrity.
- I. Use of elevators, building utilities, heat etc. by the Contractor is allowed. General Contractor shall protect, clean, and return to original function and condition any portions of the building utilized by Contractor.
- J. No construction waste materials may be disposed of in DPS dumpsters or other DPS containers.
- K. Construction areas shall be limited to the portions of the site indicated in the documents. Contractors shall provide temporary construction fencing for these areas. Construction fencing shall be minimum 6'-0" in height, constructed of chain link fabric supported by steel framework securely anchored.
- L. Smoke, dust, dirt, odors and other objectionable effects shall be controlled and limited to the immediate area of construction. The Contractor shall be responsible for cleaning other areas affected by noncompliance with this requirement including the contents of the affected areas.
- M. Work areas shall be cleaned of debris and "broom cleaned" no less frequently than at the end of each work day. Remove all debris from exterior site areas which could be wind blown.

SECTION 01010 – SUMMARY OF WORK

1.04 WORK UNDER OTHER CONTRACTS

- A. Certain elements, materials, and tasks for the project have been identified as being "Not in Contract" (N.I.C.), "By Others", or "By DPS Project Manager". Such materials and labor will be provided by others in a manner and schedule which is not intended to impede the progress of the work in this contract.
- B. The Contractor shall coordinate the construction schedule with the DPS Project Manager and Architect and shall give adequate notice as to when other work should be undertaken. The Contractor shall review with the DPS Project Manager and Architect the time required for various work requiring coordination. Work under other contracts shall be included in the Contractor's Project Schedule
- C. Bid Packages have been designed to minimize overlapping requirements and/or coordination between separate Contractors. Should separate Contracts be awarded for various portions of a single project, the affected Contractors shall meet with the DPS Project Manager and Architect prior to construction in order to develop a coordinated schedule agreeable to all parties.

1.06 OWNER'S CONTINUED OCCUPANCY

- A. The building will be occupied during construction except for the month of July, 2014. Construction operations shall minimize interference with normal functioning of building and occupants.
- B. Noise shall be limited. Radios are not permitted. If construction activities produce noise which is detrimental to the operation of the facility, the Contractor shall schedule these activities during non-occupied hours.
- C. Construction, equipment, materials, and procedures at the building entrances shall not impede emergency building evacuation.
- D. Entrances/Exits, walkways, and other areas in the vicinity of the construction subject to use by the public shall be protected from falling objects or appropriately barricaded according to governing regulations.
- E. Except as specifically indicated in the construction drawings and specifications, interruption of mechanical or electrical services, or the shut down of building systems, services or utilities shall be prohibited except with prior approval of the DPS Project Manager.

1.05 MISCELLANEOUS CONSTRUCTION

- A. The Contractor shall supply necessary backup construction, miscellaneous screws, bolts, fasteners, trim, and other accessories required for the completion of all parts of the work.
- B. Miscellaneous and accessory items shall be of a size, type, and finish appropriate to the task and compatible with the finishes of materials with which they are used.

END OF SECTION 01010

SECTION 01030 – ALTERNATE, UNIT PRICES & ALLOWANCES

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Work in this section includes material, labor, and incidentals identified and implied as "Alternates", "Unit Prices" or "Allowances" to the basic Construction.
- B. Contractor shall include on the bid form, the amounts for all identified Alternates and Unit Prices.
 - 1. Each Alternate Price bid will be accepted or rejected for inclusion in the contract amount and will be specified at the time of Contract Award.
 - 2. Each Unit Price bid will constitute a pre-determined change order amount should quantities required for the final construction vary from quantities indicated in the contract documents.
- C. The Contractor shall include all indicated "Allowances" in the Base Bid amount. The Contract Amount will be adjusted by Change Order where the actual cost of the work is greater than or less than the Allowance amount stated.
- D. The Contractor shall keep accurate records including receipts, bids, quantity measurements, etc. as needed to document the actual costs of Allowances and Unit Prices.

1.02 ALTERNATES

- A. Work identified as "Alternates" shall be subject to the evaluation and approval of the DPS Project Manager and may be selected for addition to or deletion from the Contract for Construction.
- B. The Contractor shall submit proposals for all alternates. Alternate proposals shall be those costs which may be added to or deducted from the base bid should the described work be added to or deleted from the contract for construction. The Base Bid shall reflect all work including described deductive alternates and excluding described additive alternates. **Failure to submit proposals for all alternates may result in rejection of bid.**
- C. Refer to the Drawings and Specifications for additional information regarding each **Alternate**. Where Drawings and/or Specifications are inconsistent, and the inconsistency was not corrected by Addendum, the bid shall be calculated for the greater quantity and superior quality of work.
- D. Each Bidder shall submit proposal(s) for Alternate(s) in the appropriate spaces on bid forms.
- E. Proposals for Alternate work shall reflect the difference in price for all trades impacted by all additions, deletions, substitutions, changes, or modifications, and shall include all incidental items necessary but not specifically identified.

1.03 SCHEDULE OF ALTERNATES

- A. ALTERNATE NO. 01 Lighting at Auditorium AUD:
 - 1. Work included in Alternate Bid:
 - a) Removal of existing ceiling lighting fixtures and detaching existing cables connected to light fixtures which allow the fixture to be lowered via an existing winch located on the north side of the stage (if present). Secure existing cables above ceiling at the winch box so that they are non-functioning if present.
 - b) Install uni-strut steel framing above Auditorium ceiling secured to existing ceiling and roof structure as required to support new light fixtures in new ceiling tile and grid as required.
 - c) Install ceiling grid and tile to match existing to enclose opening left be the removal of the existing light fixtures. Secure to new framing as required with fasteners.
 - d) Utilize existing circuitry and controls for new light fixtures.
 - e) Coordinate location of light fixtures with existing ceiling diffusers.

SECTION 01030 – ALTERNATE, UNIT PRICES & ALLOWANCES

- B. ALTERNATE NO. 02 New Battery Pack Egress Lighting
 - 1. Work included in Alternate Bid:
 - a) Provide lighting as indicated and noted on the drawings.
- C. ALTERNATE NO. 03 Auditorium HVAC
 - 1. Work included in Alternate Bid:
 - a) Provide HVAC as indicated and noted on drawing M0.1.

1.04 SCHEDULE OF UNIT PRICES

- A. None.

1.05 SCHEDULE OF ALLOWANCES

- A. Equipment repairs. \$5,000.00 per area identified on M0.1 Additional Work Required note no. 2.

PART 2 (NOT USED)

PART 3 (NOT USED)

END OF SECTION 01030

SECTION 01042 – MECHANICAL AND ELECTRICAL COORDINATION

PART 1 GENERAL

1.01 EQUIPMENT FURNISH/CONNECT

- A. Refer to Equipment Schedule(s) for definition(s) of responsibilities pertaining to assembly, setting, and connection of equipment items. Unless otherwise noted in the coordination schedule below or herein, final setting and connection of equipment items shall be performed by the Trade Contractor supplying the equipment item.
- B. Unless otherwise specified, all line and disconnect switches, safety cut outs, control panels, fuse boxes, or other electrical controls, fittings, and connections not a part of the fixture as furnished standard by the manufacturer, shall be furnished loose by the Equipment Manufacturer (other than special fabricated items), and shall be mounted and wired complete by the Electrical Contractor.
- C. Any sleeves or conduit required for refrigeration lines furnished and installed under the mechanical contract shall be furnished by the Mechanical Contractor and installed by other Trade Contractors in their portions of the work.
- D. Necessary flues and/or vents and fans of size and capacity required to operate fixtures specified, together with final connection between roughed-in vent openings and fixtures, will be furnished and installed by the Mechanical Contractor unless specifically indicated otherwise.
- E. All plumbing, steam, electrical, and ventilation work, both material and labor required to connect this equipment shall be furnished by the Supplying Contractor unless specifically identified otherwise. The work shall include roughing-in to points indicated on mechanical plans, and final connecting from rough-in point to various pieces of equipment requiring such connections and the supplying of all necessary materials and labor for this work, except as hereinafter noted.

1.02 WALK-IN COOLERS

- A. Refrigeration is to be performed by others. Electrical and plumbing connections to compressors, blower coils, lights, controls, etc. shall be performed by the Contractor, including interior wiring in walk-in cooling equipment and drain extensions from fixtures to floor drains and floor sinks.
- B. All traps, drains, tail pieces, valves, stops, shutoffs, and fittings necessary are to be furnished and installed by the Trade Contractor, unless specifically identified otherwise.

1.03 MECHANICAL ACCESSORIES

- A. All steam traps, valves, shutoffs, condensate pumps, and fittings necessary are to be furnished and installed by the Trade Contractor supplying components.
- B. If, because of jurisdictional trade agreements or other conditions, any work specified to be performed under this contract must be done by others, the Contractor shall sublet such work to those who are qualified to do such work or make other arrangements at Contractors own expense as approved by the Owner.

1.04 COORDINATION SCHEDULE

- A. Mechanical Contractor, Temperature Control Contractor, and Electrical Contractor shall coordinate the supply and installation of mechanical equipment requiring electrical connections for power and control. Unless otherwise indicated, all mechanical equipment and controls shall be furnished, mounted, and wired in accordance with the following schedule:

SECTION 01042 – MECHANICAL AND ELECTRICAL COORDINATION

COORDINATION SCHEDULE

	FURNISHED UNDER	SET IN PLACE OR MOUNTED	POWER WIRED & CONNECTED	CONTROL WIRED & CONNECTED
Mechanical equipment motors	MC	MC	EC	TC
Mechanical magnetic motor starters	MC	MC	EC	TC
Other equipment motors/starters	I	I	EC	I
Fused and un-fused disconnect switches & thermal overload switches	EC	EC	EC	-
Pushbutton stations and pilot lights	MC	MC	EC	TC (Note 2)
Manual operating switches	MC	MC	EC	(Note 3)
Control wiring – regardless of voltage	TC	TC	TC (Note 1)	TC
Control components: control relays, thermostats, control transformers, switches, transmitters	TC	TC	TC (Note 1)	TC
Temperature control panels, time clocks, controllers	TC	TC	TC (Note 1)	TC
Valve and damper motors and actuators	TC	TC	TC (Note 1)	TC
Control valves, solenoid valves	TC	MC	EC / TC	TC
Control dampers integral with a fan unit	MC	MC	TC	TC
Control dampers (duct mounted)	TC	MC	TC	TC
Thermowells in piping	TC	MC	-	-
Duct detectors	EC	EC	EC	TC
Thermostats	MC	MC	EC / TC	TC
Temporary heating or cooling services	MC	MC	EC	TC

EC = Electrical Contractor

I = Installer of Equipment Requiring Electrical Service (Trade Contractor Supplying the Equipment Item)

MC = Mechanical Contractor

TC = Temperature Control Contractor

Note 1: It is the intent of this specification for all conduit and wiring, which connects to control equipment or provides controls to mechanical equipment, to be provided by the Temperature Control Contractor. Other portions of this specification, which may be in conflict with this concept, shall be brought to the attention of the engineer for clarification prior to bidding the project. The electrical division (Division 16) shall provide line voltage wiring in conduit and junction boxes for the express purpose of temperature controls. It shall be the responsibility of the Temperature Control Contractor to coordinate the location of the junction boxes (if not otherwise shown on the electrical drawings) and to utilize these junction boxes for temperature control wiring. The Temperature Control Contractor shall extend line and/or low voltage wiring from junction boxes to all mechanical and control components, which required control wiring.

Note 2: Connection of auxiliary contacts, if required.

Note 3: Device is used in power wiring circuit to the equipment. Control functions are not required.

B. All temperature control conduit and wiring will be furnished and installed under the Temperature Control contract.

SECTION 01042 – MECHANICAL AND ELECTRICAL COORDINATION

- C. Division 16 Contractor shall furnish and install all wiring and conduit required for power wiring to carrying equipment full load amperage to all mechanical equipment, unless shown otherwise.
- D. All Contractors shall confirm their scope of supply prior to ordering equipment. DPS shall not be responsible for delays due to missing equipment, charges for expediting equipment, or charges for re-stocking equipment overages.

1.05 SUBMITTALS

- A. Submit coordination drawings for locations where several elements of equipment, mechanical or combined mechanical and electrical work must be sequenced and positioned with precision in order to fit into available space.
- B. Lay out the mechanical and electrical work in conformity with the contract drawings, coordination drawings, and other shop drawings, product data, and similar requirements, so that the entire mechanical system will perform as an integrated system properly interfaced with electrical work and other systems.
- C. Where necessary, prepare memoranda for distribution to each party involved outlining special procedures required for coordination of mechanical and electrical work. Include such items as required notices, reports, and attendance at meetings. Prepare similar memoranda for the Owner and separate contractors where coordination of their work is required.

PART 2 PRODUCTS No standards

PART 3 EXECUTION

3.01 SITE UTILIZATION

- A. Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water and materials.
- B. The Contractor shall note that concurrent with their work, other contractors, suppliers, and DPS personnel may be working in relatively close proximity. The Contractor will be solely responsible for coordinating their work with that of other contractors and will make no claims for failure to do so.

3.02 SALVAGE OF MATERIALS

- A. Salvage materials and equipment involved in performance of, but not actually incorporated in the work. Refer to other sections for disposition of salvaged materials that are designated to be returned to DPS. DPS wants first right of refusal on all demolished equipment.

3.03 LAYOUT

- A. It is recognized that the contract documents are diagrammatic in showing certain physical relationships of the various elements and systems and their interfacing with other elements and systems. Establishment and coordination of these relationships is the exclusive responsibility of the Contractor. Do not scale the drawings. Layout and arrange all elements to contribute to safety, efficiency and to carry the harmony of design throughout the work. In case of conflict or un-dimensioned locations, verify required positioning with the architect.

3.04 LARGE AND HEAVY EQUIPMENT

- A. The Contractor shall coordinate the requirements to be maintained for subsequent entry of large equipment units. Coordinate the movement of heavy items with shoring and bracing so that the building structure will not be overloaded during the movement and installations.
- B. Where equipment or products to be installed on the roof are too heavy to be hand-carried, do not transport across roof deck; position by crane or other device so as to avoid overloading the roof deck.

3.05 INSTALLATION

- A. Comply with manufacturer's installation instruction and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in the contract documents.

SECTION 01042 – MECHANICAL AND ELECTRICAL COORDINATION

- B. Coordinate the installation of materials and equipment above and below ceilings with suspension systems, light fixtures and other building components. Where mounting heights are not detailed or dimensioned, install services and overhead equipment to provide the maximum headroom possible.
- C. Coordinate ceiling and joist cavity space carefully with all trades. In the event of conflict, install mechanical and electrical systems within the cavity space allocation in the following order of priority:
 - 1. Plumbing waste and vent piping, roof drain mains and leaders.
 - 2. Supply, return and exhaust ductwork.
 - 3. Steam and condensate piping and traps.
 - 4. Fire sprinkler mains and leaders.
 - 5. Electrical conduit.
 - 6. Domestic hot and cold water, lab gas piping.
 - 7. Heating and cooling water supply and return piping.
 - 8. Fire sprinkler branch piping and sprinkler run-outs.
 - 9. Pneumatic control piping and tubing.
- D. Coordinate the installation of equipment and piping support, sleeves, and other structural components that penetrate walls, floors, ceilings, or roofs.

END OF SECTION 01042

SECTION 01045 – CUTTING AND PATCHING

PART 1 GENERAL

1.01 DEFINITIONS

- A. Cutting and Patching is distinct from but related to Selective Demolition, which is defined elsewhere.
- B. Cutting and Patching is used to refer to the work required to make penetrations or openings in materials or assemblies for the purpose of completing other work such as the installation of pipes, wires, accessories, assemblies, etc., and the repairs to those materials.

1.02 PENETRATIONS

- A. Penetrations and/or openings required for completion of the work (whether shown or not) are to be completed by the contractor requiring the penetration or opening.
- B. Before cutting, check drawings, shop drawings and the work of other trades to coordinate penetration locations to avoid damage to structure and/or building systems.
- C. Sleeves or other built-in components shall be provided by the trade contractor(s) requiring the sleeve (or built-in item). Trade Contractor(s) requiring sleeves or imbedded items shall provide coordination of the proper location and alignment of such sleeves, etc. Embedded items shall be provided to trades responsible for the construction of areas receiving sleeves or embedded items.
- D. All penetrations in surfaces exposed to weather, fire walls, surfaces exposed to view, and other similar conditions shall have pipe sleeves or final assemblies fit tight to surrounding construction. Penetrations in fire rated assemblies shall be sealed as required to maintain the integrity of the assembly. Fireproofing is specified elsewhere.
- E. All penetrations of pavement, concrete, masonry and other cementitious materials shall be core drilled or saw-cut.
- F. All materials exposed to view in the finished construction shall be cut with tools appropriate to facilitate patching and final finishes.
- G. No penetration shall be created by jackhammer or other impact-cutting device unless approved by the Architect. Utilize drilling and sawing type equipment only.
- H. Fire caulking and other requirements associated with the penetration shall be provided by the trade constructing the penetration in full compliance with the requirements of this specification and governing codes.

1.03 EXISTING CONSTRUCTION

- A. To the greatest extent possible, existing construction, finishes, and mechanical, and electrical systems which are not scheduled to be removed shall be protected from damage during the course of construction. Cutting and patching shall be kept to the minimum required for proper execution of the work.
- B. Cutting and patching work shall not compromise the exiting of occupied spaces.
- C. Cutting and patching and dismantling shall be performed in segments judged by the Contractor to be complete at the end of each work day so as not to leave any unstable or unsafe conditions overnight.
- D. Repair all intentional and accidental damage incurred in the course of construction to match existing construction with no noticeable differences in continuity, function, or appearance. Repairs shall be performed by trades experienced in working with the material being repaired. The repair or patching shall be acceptable to the Architect.
- E. Repair all cutting of walks, curbs, paving, etc.. Repairs of walks, curbs, paving, etc. on public rights-of-way shall be made in accordance with City requirements. Cutting and repairs to walks shall be in full panel sections. Repairs on school property shall be as indicated in the Contract Documents.

SECTION 01045 – CUTTING AND PATCHING

- F. Notify the Architect immediately regarding damage having potential structural implications and upon encountering unexpected existing condition that could affect the work as required by the Construction Documents.
- G. Interruption of mechanical or electrical services shall be coordinated with the DPS Project Manager.
- H. All original components to be reused in the finished construction shall be appropriately marked and catalogued, maintained and stored to assure proper assembly in finished construction. Manufacturer's written instructions shall be followed where applicable.

1.04 NOTIFICATIONS TO THE ARCHITECT

- A. Except as otherwise detailed or indicated, the Contractor shall notify the Architect 72 hours prior to any cutting activity and acquire his approval before any of the following:
 - 1. Penetration of structural building components.
 - 2. Planned penetrations larger than one square foot which are not shown on the drawings.
 - 3. Penetration of work provided by Owner or "Others" outside of this contract.
 - 4. Penetrations affecting the operational life, maintenance or safety of operational elements .
 - 5. Penetrations or cutting of weather-exposed or moisture-resistant elements or systems.
 - 6. Penetrations affecting the visual qualities of exposed elements.
 - 7. Any element where the existence of a penetration or the process of cutting may render the element unsuitable to receive subsequent work.

1.05 WORK BY OTHERS

- A. Where cutting and/or patching is identified as being "BY OWNER" or "BY OTHERS", the Contractor shall coordinate and schedule his work with work by others to provide a smooth interface of various components.

1.06 UTILITY AND BUILDING SYSTEM INTERRUPTIONS

- A. Except as specifically indicated otherwise in the Contract Documents, interruption of mechanical and electrical services or building system operation shall be prohibited without the prior approval of the Architect and/or the DPS Project Manager.
- B. A minimum of three days (72 hours) notice must be given prior to any utility or building system shutdown.
- C. Where interruption of the building fire alarm system is required for construction work, the Contractor shall coordinate requirements with the DPS Project Manager and the Denver Fire Department. The Contractor shall coordinate activities and pay for any fire watches required by the Denver Fire Department.

1.07 FIELD MEASUREMENTS

- A. Verify locations and dimensions prior to saw-cutting or drilling. Notify the Architect if dimensions are at substantial variance with indicated dimensions.

1.08 PROTECTION (SURROUNDING AREAS OR SURFACES)

- A. Protect adjacent areas and surfaces from water staining or other damage due to cutting operations.

1.09 SCHEDULES

- A. Cutting and patching operations affecting the weather-tightness of structures shall be coordinated to provide for a minimum period of exposure to weather.
- B. Cutting and patching operations affecting the security of the building shall be coordinated so that temporary construction measures can be completed to ensure that the building security is not compromised in any manner at any time.

**END OF SECTION
01045**

PART 1 - GENERAL

A. ARCHITECT COORDINATION

1. As identified in other Sections of these specifications, the Contractor is required to notify the Architect in advance of certain stages of work.
2. This requirement is intended to facilitate proper coordination, testing, quality control, and to review work for compliance with these Construction Documents.
3. The Contractor may be responsible to the Owner for the costs of extraordinary services of the Architect, Engineers and Testing Companies due to inaccurate notifications which result in inaccurate, untimely or unnecessary visitations to the site.
4. The Contractor shall bear full responsibility for delays caused by improper compliance with this Section. Failure to provide prior notification shall be grounds for rejection of identified work, requiring removal and reconstruction at the Contractor's expense.
5. All work required to be reviewed or tested by Architect or Engineer shall not be covered until such reviews/tests are completed. The Contractor shall uncover all enclosed work which has not had required reviews/testing and restore areas at his own cost.

B. SPECIAL NOTIFICATIONS

1. The Contractor shall notify the Architect and DPS Project Manager 72 hours prior to the commencement of the following activities:
 - a. Any construction activity which will produce inordinate noise or dust during normal school operating hours.
 - b. The interruption of any utility service to existing buildings including fire alarm and security systems.
 - c. The Contractor shall allow for rescheduling of any activities which may cause disruption of normal school activities.

C. SUBMITTAL COORDINATION

1. Under the terms and conditions of this Contract, the Contractor shall submit information to the DPS Project Manager through the Architect prior to commencing identified portions of the work.
2. The Contractor shall be responsible for understanding requirements of this Contract and for the coordination of Architect involvement so as to have no adverse impact upon the schedule for the work.
3. Minimum coordination requirements include the following:
 - a. Section 01340 – Submittals and Shop Drawings
 - b. Section 01390 - Qualification Certification
 - c. Section 01049 - Architect Notification
 - d. Section 01410 - Testing & Laboratory Services
 - e. Section 01730 - Operation and Maintenance Data

SECTION 01049 – ARCHITECT COORDINATION

- f. Section 01740 – Warranties and Bonds
- 4. Refer to other sections of these Division 1 Specifications and specific requirements of individual technical specifications Divisions 2 through 17 for more detailed requirements.

END OF SECTION 01049

SECTION 01060 – REGULATORY REQUIREMENTS

PART 1 GENERAL

- 1.01** Work in this project shall conform to all applicable codes, standards, regulation, etc., required, issued, or otherwise enforced by any and all authorities having jurisdiction including, but not necessarily limited to:
- A. International Building Code 2009 and Denver Amendments 2011
 - B. International Mechanical Code 2009 and Denver Amendments 2011
 - C. International Plumbing Code 2009 and Denver Amendments 2011
 - D. International Fire Code 2009 and Denver Amendments 2011
 - E. International Fuel Gas Code 2009 and Denver Amendments 2011
 - F. International Energy Conservation Code 2009
 - G. National Fire Alarm and Sprinkling Code NFPA 72
 - H. National Electrical Code 2011
 - I. Life Safety Code (NFPA 101, 2003 edition)
 - J. Colorado Department of Health and Environment (CDPH&E).
 - K. City and County of Denver Health and Hospitals
 - L. Wastewater Management
 - M. City and County of Denver Zoning
 - N. Occupational Safety and Health Administration (OSHA)
 - O. Colorado Air Quality Control Commission (CDPH&E)
 - P. Denver Water Board
 - Q. ICC/ANSI A117.1
 - R. Any and all other local, state or national authorities.
 - S. Denver Public School Standards
- 1.02** See individual specification sections for other codes applicable to this project.
- 1.03** The Contractor is responsible for notifying the Architect of any knowledge of possible conflicts or discrepancies between requirements of these Construction Documents and applicable Codes, Standards, Regulations, etc.
- 1.04 SUBMITTALS**
- A. Contractor shall submit to the DPS Project Manager one copy of the following at the time the permit is pulled and again when all sign-offs are completed:
 - 1. Building Permit
 - 2. Mechanical Permit
 - 3. Electrical Permit
 - 4. All "ENVIRONMENTAL PERMITS" (See partial listing in Part 2.)

PART 2 BUILDING PERMITS AND FEE

- 2.01** See the General Conditions for additional information regarding permits and fees.
- 2.02** The Contractor shall pay all permit charges and fees associated with the work, which have not been identified as being paid by Owner. The Contractor shall arrange for required inspections and pay all inspection fees associated with the work.
- 2.03** Denver Public Schools has paid the "Plan Review Fee". The balance of permit costs shall be born by the Contractor.

SECTION 01060 – REGULATORY REQUIREMENTS

2.04 HOTWORK PERMITS

- A. HOTWORK PERMITS are required by the Denver Fire Prevention Bureau for all operations that may produce a source of ignition. The Contractor and all affected sub-contractors shall obtain and pay for the required Hotwork Permit from the Fire Department
- B. Sources of ignition include but are not limited to: welding, soldering, grinding, sweating and any other activity producing sparks, flame or the heating of materials capable of igniting surrounding materials.

2.05 ENVIRONMENTAL PERMITS

- A. GENERATOR PERMIT must be obtained by the Contractor from the Denver Fire Department before installation of a generator is begun. Contractor shall pay for this permit.
- B. FLAMABLE/COMBUSTABLE PERMITS are required from the Denver Fire Department and must be obtained by the Contractor prior to the storage of any flammable or combustible materials, and before a TCO is issued. Contractor shall coordinate and pay for this permit.
- C. HAZARDOUS MATERIALS INVENTORIES are required by the Denver Fire Department before issue of a Temporary Certificate of Occupancy. The DPS Project Manager will provide inventory lists to the Denver Fire Department. A copy of HMIS submittal information will be made available to the Contractor upon request.
- D. PHASE 1 AND PHASE 2 ENVIRONMENTAL SAMPLING is sometimes required for DPS school sites. Where required the DPS Project manager will arrange, pay for and schedule sampling.
- E. ENVIRONMENTAL SAMPLING is conducted by DPS before any soils are removed from the site. The Contractor is responsible for the Environmental Sampling and testing of any soils materials before they are imported onto the site. The Contractor shall pay for all required permits, sampling and laboratory testing of import materials.
- F. DISPOSAL OF HAZARDOUS MATERIALS requirements of Federal, State and Local regulatory agencies must be adhered to at all times. The Contractor shall monitor all disposal of construction waste materials and existing materials removed from the site to assure that these products are being disposed of in a manner acceptable to regulatory agencies. All permitting and inspection costs associated with disposal of materials shall be born by the Contractor.

PART 3 INSPECTIONS

3.01 The Contractor is responsible for coordinating all inspections required by Contract and all regulatory agency inspections including but not limited to:

- A. Mechanical inspections
- B. Electrical inspections
- C. Hotwork permits
- D. Health Department inspections
- E. Fire Department inspections
- F. All other inspections required by regulatory agencies having jurisdiction.
- G. Notification when deficiencies have been corrected.

3.02 AGENCIES HAVING JURISDICTION OVER DPS SCHOOLS

- A. Due to Denver Public Schools being under split jurisdiction for code inspections and enforcement, the following list is intended to clarify current jurisdictional issues. The following list pertains to SCHOOLS only. Non-school facilities are under different jurisdictional rules.
- B. The State of Colorado Plumbing Board has jurisdiction over the permitting and inspections of:
 - 1. Building interior sanitary sewer and plumbing systems, fixtures, etc.
 - 2. Building interior storm sewer

SECTION 01060 – REGULATORY REQUIREMENTS

3. Building interior domestic water piping

C. The State of Colorado Electrical Board has jurisdiction over the permitting and inspection of :

1. Electrical Main Switch Gear.
2. Electrical Wiring, devices and fixtures.

D. The Denver Fire Department (Fire Prevention Bureau) has jurisdiction over:

1. Fire Alarm System.
2. Fire Damper operation.
3. Kitchen fire suppression (alarm conditions only).
4. Flammable materials storage.
5. HMIS submittals (Hazardous Materials Inventory Sheets).
6. Hotwork permits – See General Conditions of the Contract, Article 4, for HOTWORK permit requirements.

E. The Denver Water Board has jurisdiction over:

1. Water Service Connections
2. Buried water lines outside of the Building Envelope.
3. Interior and exterior backflow prevention devices for containment.
4. Water meter connections.

F. Denver Zoning has jurisdiction over:

1. Parking lots
2. Landscaping
3. Streets, curb and gutter, and sidewalk construction.
4. All other site construction as identified by Denver Zoning.

G. Denver Transportation has jurisdiction over Right-of Way Permits.

H. Denver Wastewater Management has jurisdiction over:

1. Storm and Sanitary Sewers outside of the Building Envelope (Contractor must coordinate inspections at the interface of state and local jurisdictions.)
2. Storm Water detention ponds
3. Construction site runoff and storm water regulations.

I. The Denver Building Inspection Division has jurisdiction over:

1. Kitchen Fire Suppression Systems (suppression system and HVAC interlocks)
2. Electrical associated with fire detection and prevention.
3. Building Heating, Ventilation and Air Conditioning.
4. All other Building interior finishes and construction including structures, framing, masonry and fire separation and protection construction.
5. Kitchen sanitation and general toilet facilities (through special personnel within the Division).
6. Elevators
7. Building interior mechanical hydronic piping.

J. City and County of Denver, Department of Environmental Health has jurisdiction over:

1. Kitchen design and finishes.
2. Toilet rooms design and finishes.

K. Xcel Energy has jurisdiction over the installation, location and construction of Electrical and Natural Gas service to the building.

3.03 The Contractor has exclusive responsibility for construction means and techniques including compliance with all regulations governing safety and health of employees and the public in the vicinity of the construction. The Contractor shall assess proposed conditions and make all necessary preparations and precautions such as shoring, bracing, scaffolding, and other temporary construction necessary to accomplish the work in full compliance with the requirements of this section.

SECTION 01060 – REGULATORY REQUIREMENTS

It shall be the final responsibility of the Contractor to arrange and procure any other permits, licenses, inspection, and all other documentation of compliance required by governing Federal, State, County, Municipal and special laws and regulations.

END OF SECTION 01060

SECTION 01065 – HAZARDOUS MATERIALS REQUIREMENTS

PART 1 GENERAL

1.01 WORK BY OTHERS

A. Asbestos Removal:

1. The School District has completed a survey of all school buildings to identify asbestos containing materials and is currently involved in a program to remove the asbestos hazard. Where asbestos materials were known to exist in locations affected by this project, abatement measures have been (or will be) taken by the Owner under separate contract. The Contractor shall coordinate his sequence and schedule with that of asbestos abatement work.

1.02 QUALITY ASSURANCE

- A. Asbestos containing materials may exist within the general project area where such materials are not expected to be disturbed during the work. The Contractor shall review the A.H.E.R.A. report at the project site and become familiar with known asbestos containing materials in the work areas. If information is unclear as to the type of material that may be disturbed, it is the contractor's responsibility to consult with the DPS Project Manager for clarification.
- B. Denver Public Schools requires that all contractors working on District property possess at a minimum 2-hour asbestos awareness training to ensure that asbestos material is not accidentally disturbed during the construction process.

1.03 SPECIAL NOTICE OF SUPERFUND DESIGNATION

- A. **General Note:** When the contractor doing work on any DPS property detects free liquid products in the ground or when a solvent or petroleum odor is detected, the Contractor shall cease all operations in the area of concern and immediately notify the DPS Hazardous Materials Specialist or the DPS Project Manager.
- B. **Note to Contractors doing earthwork at Swansea, Harrington, Bruce Randolph, Pioneer, Wyatt, Mitchell, and Cole:** These schools are located within the Vasquez/I-70 Superfund site. The potential health concern for working at this site is exposure to metals by breathing in soil particles once they become airborne. Although the soil at these schools has been tested and found to be below EPA's action levels of 400 parts per million (ppm) for lead and 70 ppm for arsenic, contractors at these sites should take precautions to not allow excessive fugitive dust on the property and no off-property transfer of fugitive dust. Workers that are concerned about exposure can wear a dust mask to prevent inhalation of any dust. If you want specific sampling results for these sites, contact the DPS Hazardous Materials Specialist.
- C. **Note to Contractors doing earthwork at Garden Place:** This school is located within the boundary of the proposed ASARCO Globe Superfund site. The potential health concern for working at this site is exposure to metals by breathing in soil particles once they become airborne. The soil at this school has been tested and areas that contained greater than 73 parts per million (ppm) cadmium, 500 ppm lead or 70 ppm arsenic has been removed from the site. Although the soil has been tested and removed if necessary, contractors should take precautions to not allow excessive fugitive dust on the property and no off-property transfer of fugitive dust. Workers that are concerned about exposure can wear a dust mask to prevent inhalation of any dust.
- D. **Note to Contractors doing earthwork/excavation at Ashgrove/RMSEL:** This school is located within the Redfield Rifle Scope clean-up project. The concern at this school is groundwater contamination and not a health issue for workers at the site or for the school. If a contractor is doing excavation work at the site and detects a solvent odor, they should stop

SECTION 01065 – HAZARDOUS MATERIALS REQUIREMENTS

work and immediately contact the DPS project manager or the DPS Hazardous Materials Specialist.

1.04 IMPORT AND EXPORT OF FILL DIRT

- A. No materials may be removed from the project site nor imported to the project site without proper analysis and documentation of the contents of the soils.
- B. DPS will provide evidence of the testing of soils on DPS property and the analysis thereof. Soils containing hazardous materials that are removed from the site shall be disposed of in a manner approved by the EPA. Any contractor removing such materials shall provide certification that the material was properly handled.
- C. Before any fill dirt is imported to the site, the Contractor shall provide evidence that the material is free of hazardous materials.

1.05 SUBMITTALS

- A. MATERIAL SAFETY DATA SHEETS (MSDS):
 - 1. Copies of all material safety data sheets for all applicable products, including but not limited to; paint, adhesives, mastics, solvents, and finishes, etc. shall be retained on site by the General Contractor for all applicable products used during the construction and/or remodeling activities at all Denver Public Schools. Copies of all MSDS's shall be supplied to the Owner's Representative upon request, and shall be included when the final as-built construction prints are delivered as per the applicable contract specifications.
- B. ENVIRONMENTAL ANALYSIS
 - 1. For all import fill materials, provide Environmental analysis including test results for **RCRA8**, **TPH** and **BTEX** analyses provided by a certified independent testing agency.
 - 2. Submit test results to DPS Project Manager for review by DPS Hazmat officers.

1.06 PROJECT/SITE CONDITIONS

- A. HAZARD COMMUNICATION REQUIREMENTS:
 - 1. All Contractors are responsible for compliance with mandatory federal rules and regulations concerning Hazard Communication, specifically those regulations contained in: 29 CFR 1910.1200 Hazard Communication.
 - 2. All General Contractor and sub-contractors working at sites under the control of Denver Public Schools shall make available to the Owner's Representative, upon request, copies of the Hazard Communication Program used by their firm. In addition to this requirement, all regulations related to Multi-employer workplaces shall be adhered to. These regulations are found in 29 CFR 1910.1200,(e) (2) (i) through (e) (4) specifically:
 - (e) (2) Multi-employer workplaces. Employers who produce, use, or store hazardous chemicals at a workplace in such a way that employees of other employer(s) may be exposed (for example, employees of a construction contractor working on-site) shall additionally ensure that the hazard communication programs developed and implemented under paragraph (e) include the following:
 - (e) (2) (i) The methods the employer will use to provide the other employer(s) with a copy of the material safety data sheet, or to make it available at a central location in the workplace, for each hazardous chemical the other employer(s)' employees may be exposed to while working;
 - (e) (2) (ii) The methods the employer will use to inform the other employer(s) of any precautionary measures that need to be taken to protect employees

SECTION 01065 – HAZARDOUS MATERIALS REQUIREMENTS

- during the workplace's normal operating conditions and in foreseeable emergencies; and,
- (e) (2) (iii) The methods the employer will use to inform the other employer(s) of the labeling system used in the workplace.
 - (e) (3) The employer may rely on an existing hazard communication program to comply with these requirements, provided that it meets the criteria established in this paragraph (e).
 - (e) (4) The employer shall make the written hazard communication program available, upon request, to employees, their designated representatives, the Assistant Secretary and the Director, in accordance with requirements of 29 CFR 1910.20 (e).
3. The referenced regulations were excerpted from 29 CFR 1910.1200. This excerpt shall not be relied upon for compliance with mandatory federal, state and local regulations. The Contractor shall comply with all such regulations and shall be solely liable for insuring that all requirements under applicable regulations are met.
- B. OSHA Compliance:
- 1. All Contractors are responsible for compliance with mandatory Federal rules and regulations concerning OSHA Compliance for the various worksite activities they are completing.

1.07 ASBESTOS CONTAINING MATERIALS

- A. To the best of the knowledge of Denver Public Schools, the following asbestos containing materials are known to exist in the construction area. Contact DPS Project manager for such information.
- B. DPS Project manager shall provide the Architect the results of all results of testing for asbestos containing materials.
- C. If additional asbestos containing materials are suspected, after construction begins, please contact DPS Project Manager.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 ASBESTOS DISCOVERY

- 1. The Contractor is cautioned to be alert to the possibility that his work may uncover asbestos containing materials. If suspected materials are found, the Contractor shall notify the Owner and stop all work in the area immediately. If the suspected materials prove to contain asbestos, the Owner will arrange to have the materials abated in a timely manner.

3.02 IMPORT FILL MATERIALS

- 1. Before any fill materials are imported onto the project site, the Contractor shall provide all required information as to the suitability of the materials for the intended use and shall provide certification that materials are free of hazardous materials.

Exhibit “A” Sample Form:



DENVER PUBLIC SCHOOLS – DEPARTMENT OF FACILITY MANAGEMENT
Asbestos Acknowledgement Form

FACILITY:

PROJECT:

PROJECT MANAGER:

I have been informed that the Asbestos Hazard Emergency Response Act (AHERA) Management Plan for this facility has been made available to me and that asbestos-containing materials have been identified as being present in this building.

I am aware that the terms of the Construction Agreement provide that it is my duty to inform my employees and any and all subcontractors and their employees of the availability of the AHERA Management Plan and the presence of asbestos.

Any incident involving the disturbance of asbestos containing materials and any questions will be immediately reported to the Denver Public Schools Environmental Services Department (720-424-5496).

DATE: _____

SIGNATURE: _____

NAME: _____

COMPANY AND/OR CONTRACTOR:

END OF SECTION 01065

SECTION 01078 - DEFINITIONS AND CONVENTIONS

PART 1 GENERAL

1.01 This section defines certain words, phrases, and conventions used in the Construction Documents. Definitions and conventions specified in this section shall apply unless specifically indicated otherwise elsewhere in the Construction Documents.

1.02 DEFINITIONS

ALTERNATE – A defined change to the base contract scope of work which, if accepted, modifies the Contract Price by the amount stated in the Bid Form. ALTERNATES are always defined by the Architect and are described in the Contract Documents. The acceptance or rejection of ALTERNATES occurs prior to the contract signing.

ALTERNATIVE - A defined change in the base contract (see ALTERNATE). «A/E shall review and confirm use of Alternative. Use of the term should be avoided if possible.»

APPROVED EQUAL – Refers to a product accepted as equal to the specified item BEFORE THE BID and identified in an Addendum.

ARCHITECT – The primary design professional (see General Conditions for full definition).

BY OTHERS – Work performed by parties outside of the specific trade indicated in the Specifications.

CONTRACT or CONTRACT DOCUMENTS – All Drawings, Specifications, Contracts, Agreements, etc. included as part of the contract (see General Conditions for full definition).

CONTRACTOR – Each person or firm employed by the Owner (see General Conditions for full definition).

DAYS - Unless otherwise stated, the term "days" shall refer to "calendar days".

DEMOLISH (also DEMO) - Dismantle a defined component of existing construction, remove it from the site, and dispose of it in an acceptable manner.

DISPOSE – Remove from the project site.

DRAWINGS (also PLANS) - Drawings prepared by the Architect to assist in showing the work included in the Contract (see General Conditions for full definition).

DPS PROJECT MANAGER – The authorized agent for Denver Public Schools.

ENGINEER - Design professional acting as consultant to the Architect and/or Owner.

EQUIVALENT – See 'OR EQUAL' «A/E to review use of this word in the text body and verify that use is clear. DPS suggests that "OR EQUAL" or "APPROVED EQUAL" be used instead of "EQUIVALENT"»

FINAL COMPLETION - See General Conditions for full definition.

FINAL ACCEPTANCE – The administrative action by the Denver Public Schools Board of Education authorizing final payment and settlement of the Contract (see General Conditions for full definition).

FURNISH – Deliver material to the project site and/or supply labor for a specific task.

SECTION 01078 - DEFINITIONS AND CONVENTIONS

INDICATED - Information communicated in any portion of the Construction Documents. Cross-referencing between portions of the Construction Documents is sufficient for complete communication.

INSTALL - Contractor operations at the project site. INSTALLED components may be temporary or permanent.

NOT IN CONTRACT (NIC) – Work or actions which are not part of the Contract for Construction, but which may require the Contractor to coordinate and/or schedule the activity, product installation, etc.

NOTICE – A written document delivered to the appropriate party (see General Conditions for full definition).

OPTION – A specified product, scope of work or procedure which the Contractor may select in lieu of other specified products, scopes or procedures. The Contractor may only choose between specified OPTIONS.

OR EQUAL – The term 'Or Equal' indicates that products other than those specified will be considered for approval by the Architect and Owner **PRIOR TO THE BID**. All products specified in this specification shall be considered to be open for approval of substitute products unless otherwise indicated. No substitutions will be considered after the bid. All accepted substitutions shall be published in Addenda.

OWNER – Denver Public Schools (see General Conditions for full definition).

PLANS (or DRAWINGS) – Drawings prepared by the Architect to assist in showing the work included in the Contract (see General Conditions for full definition).

PROJECT - All work associated with the complete scope of work indicated in the Contract Documents.

PROVIDE - Supply and install, complete systems ready for their intended use. See INSTALL.

REINSTALL - Install a component of existing construction (which has been removed from its initial location) into new construction in the manner indicated.

REMOVE - Dismantle a defined component in a manner protecting the component for future use.

SALVAGE – Remove in a manner preserving the integrity of the item, set aside, store and protect for future reinstallation.

SPECIFICATION(S) (also SPECIFIED) – The written instructions describing the products, materials and/or methods required for the work.

SUB-CONTRACTOR or SUBCONTRACTOR – Any person or firm having a contract with the General Contractor or any intermediate Sub-Contractor at any tier (see also General Conditions of the Contract).

SUBMIT – Deliver certain documents and/or other specific items for use, review and/or approval by the Architect and/or Owner.

SUBSTANTIAL COMPLETION – The stage of construction where the work is sufficiently complete for the Owner's use (see General Conditions for full definition).

SUBSTITUTION – A product or process which has been accepted by the Architect and Owner as equivalent to the specified product or process **PRIOR TO THE BID** and so indicated in an Addendum.

SECTION 01078 - DEFINITIONS AND CONVENTIONS

SUPPLY – Contractor action of making a component available for installation.

WORK (THE WORK) – Construction and tasks indicated in the Contract Documents (see General Conditions for full definition).

1.03 CONVENTIONS

IMPERATIVE LANGUAGE - Where imperative language is used in the Construction Documents it is directed at the Contractor and is a requirement of the Contract (i.e. "shall", "will", "must". "may", "can").

END OF SECTION 01078

PART 1 GENERAL

1.01 CONSTRUCTION PROGRESS MEETINGS

- A. The Contractor shall meet at the project site with the Architect and Owner for regularly scheduled construction progress meetings. For this project, these meetings will be held once each week during periods of construction activity.
- B. Weekly construction meetings shall include:
 - 1. Construction meeting
 - a) General progress and status of the Project.
 - b) Review and discussion of Weekly Progress Report as defined in Section 01310.
 - c) Comparison of weekly progress with the project master schedule.
 - 2. Construction Schedule status:
 - a) Portions of the work ahead of schedule
 - b) Portions of the work behind of schedule
 - c) Critical materials delivery problems
 - 3. Change Order status:
 - a) items pending pricing
 - b) items pending approval
 - c) items pending definition and request for proposal
 - 4. Submittals Status:
 - a) critical items pending submittal
 - b) critical items pending review
 - c) critical resubmittal items
 - 5. Construction Problems
 - a) discussion of construction problems arising from:
 - i) unknown conditions discovered
 - ii) sequencing problems
 - iii) others
 - iv) resolution of undefined construction details and/or procedures.
 - 6. Review of unresolved problem from previous meetings.
 - 7. Observation of construction to identify and resolve construction issues.

1.02 PRE-PHASE MEETINGS

- A. At various times during the progress of the work, the Contractor shall conduct pre-phase meetings for the trade(s) involved in the next portion of the work.
- B. The pre-phase meeting shall include:
 - 1. Documentation of parties present.
 - 2. Review of permits required and status of each.
 - 3. Review of submittals required and status of each, and verification that submittals comply with specified requirements.
 - 4. Review of materials delivery status.
 - 5. Verification that materials comply with specified requirements.

SECTION 01200 – PROJECT MEETINGS

6. Materials storage requirements and provisions made for meeting requirements
7. Review of maintenance requirements for stored materials and provisions made for compliance with manufacturer's requirements.
8. Review of all Specification requirements for the work considered.
9. Review of the status of required preceding work.
10. Review of testing and inspection requirements and coordination of same.
11. Review of As-Built and Operation and Maintenance documentation and methodology for recording variations from plans and the methodology for accumulation of Project Record Documents.

PART 2 MATERIALS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 01200

SECTION 01310 – PROGRESS SCHEDULES

PART 1 GENERAL

1.01 SUBMITTALS

- A. Refer to the General Conditions for Construction for Progress Schedule format and reporting requirements.
- B. The Contractor(s) shall submit a complete, written schedule to the Owner and Architect covering all portions of the work in this Contract. No pay applications will be processed until an acceptable construction schedule is on file with the District. An acceptable schedule shall show accurate construction sequences and activity durations separated into logical components and clearly indicating the relationships between preceding and succeeding activities. The Schedule shall include time allotments for:
 - 1. Permit application, review and permit issue time
 - 2. Submittal preparation time
 - 3. Submittal review time (Include 5 business days per submittal.)
 - 4. Resubmittal time and review.
 - 5. Product production and delivery time
 - 6. Temporary protection
 - 7. Systems testing
 - 8. Inspections by permitting authorities
 - 9. Substantial completion inspection
 - 10. Completion of punchlist work
 - 11. Verification inspection
 - 12. Systems operational training
 - 13. Final closeout processes including submittal of O&M Manuals and As-Built Documents.
- C. Critical Schedule Items:
 - 1. The schedule shall commence with the issue of NOTICE TO PROCEED and shall terminate with the Final Acceptance for the project. The Date of Substantial Completion shall be such as to allow the Owner to occupy the building and accept the work by the date specified in the advertisement for bids.
- D. Construction schedule shall be critical path or other format acceptable to the Architect and Owner.

1.02 WEEKLY PROGRESS REPORTS

- A. At each weekly Construction Progress Meeting, the Contractor shall present a three week schedule of current construction activities. The schedule shall contain planned and actual activities and dates for the previous week, the current week and the next week. The three week schedule shall be presented in a consistent format to enable easy comparisons of current activities to the previous period and the overall schedule.
- B. On the request of the Owner and/or Architect, the Contractor shall provide detailed information on early and late start dates, early and late finish dates, float and the activities which precede and succeed each activity.

SECTION 01310 – PROGRESS SCHEDULES

1.03 MONTHLY PROGRESS REPORTS

- A. The Contractor shall submit monthly progress reports to the Architect indicating the actual progress of the work. The format for the monthly progress reports shall be the same as that of the approved Construction Schedule.
- B. The monthly progress schedule update shall clearly mark or highlight all changes in construction sequence, planned durations, benchmark dates or other changes to the approved schedule.
- C. All applications for payment must be accompanied by the monthly progress report. No applications for payment will be processed if current progress reports have not been submitted, the report not accurate or is inconsistent with the Application for Payment.

1.04 COORDINATION

- A. The Contractor shall carefully coordinate demolition and new construction to prevent excessive exposure of unprotected building components.
- B. The Owner reserves the right to request reasonable modifications to construction schedules to accommodate special circumstances.

1.05 ARCHITECT NOTIFICATION

- A. Within 21 calendar days of the Notice to Proceed, the Contractor shall identify in writing to the Architect all specified materials, products, and components which cannot be delivered and installed within the Contract Schedule. Formal changes for items and/or schedule will be considered to accommodate those items which are beyond the control of the Contractor.
- B. Material, Product and Component delays not previously identified according to this Section of the Specifications shall be the exclusive responsibility of the Contractor and subject to the penalties defined in the Supplemental General Conditions.
- C. In the interest of Project Scheduling, within 14 calendar days after the Notice to Proceed, the General Contractor shall submit all Division 08700 and Division 08100 Submittals.

END OF SECTION 01310

SECTION 01330 – LAYOUT AND CONTROL

PART 1 GENERAL

1.01 CONTROL LINES AND POINTS

- A. The Contractor shall employ the services of a registered Registered Land Surveyor to establish the base lines, grade elevations, and to locate all columns in exact accordance with the Contract Documents. Provide all stakes, templates, platforms, ranges and labor required in the setting of control points and the laying out of the work. The Contractor shall preserve and maintain all control lines and points until the project is accepted.

1.02 LAYOUT

- A. Working from lines and levels established by the property survey, as indicated in relation to the Work, establish and maintain bench marks, batter boards and other dependable markers to set the lines and levels for the work at each story of construction and elsewhere on the site as needed to properly locate every element of the work for the entire project.
- B. Calculate and measure required dimensions as shown within recognized or specified tolerances. Do not scale the Drawings. If any dimension cannot be determined by written dimensions or by the calculation of dimensioned components, contact the Architect for additional instructions and directions.
- C. Document any supplemental instructions from the A/E and distribute documents to Architect and Owner.

1.03 COORDINATION

- A. Coordinate all trades and provide additional benchmarks, levels, etc. as may be needed for proper execution of the work.

1.04 RECORDS AND SUBMITTALS

- A. Contractor shall maintain a copy of all survey notes.
- B. Upon request, the Contractor shall deliver a copy of all survey notes to the Architect and/or Owner.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION 01330

PART 1.00 - GENERAL

1.01 SUBMITTALS

- A. Submittals shall conform to the following requirements and procedures:
- B. SHOP DRAWINGS (SD)
 - 1. Shop Drawings shall be clear and accurate graphic representations drawn at an appropriate scale, with complete information, details, and dimensions necessary for proper fabrication, construction, assembly, and installation. Shop Drawings shall convey compliance with the intent of the design and provide relevant information needed by others who may have to interface or coordinate with the construction or installation of the product submitted.
- C. ROUGH-IN DRAWINGS (RD)
 - 1. For all equipment requiring mechanical and/or electrical connections, rough-in drawings shall be provided which show size and location required for all utilities. Where flexible or quick-connects are to be provided, submittals shall clearly show the size, type, and location of rough-in piping/electrical etc.
- D. COORDINATION DRAWINGS
 - 1. Submit coordination drawing when required by the Contract Documents. Coordination Drawings shall consist of clear representations of various project components which are drawn to scale for the purpose of verifying the relationships and/or clearances required for the various components.
 - 2. The Contractor shall prepare Coordination Drawings wherever the complexity or difficulty of construction require close coordination of various project parts.
- E. PRODUCT DATA (PD)
 - 1. Product Data, including manufacturer's literature, specimens, guarantees/warranties, and test data.
- F. SAMPLES (SA)
 - 1. Provide samples identical to conditions and materials proposed in the work. Where the Architect's selection is required, provide a complete set of optional samples. Where required, prepare samples to conform to the Architect's specifications.
 - 2. Adequately label each sample for distinguishing and precise future duplication in the work.

EDIT NOTE: A/E TO REVIEW AND MODIFY NOMENCLATURE AS APPROPRIATE
- G. REGULATORY SUBMITTALS
 - 1. Submittals to regulatory agencies shall be provided in the quantities and formats as specified by the regulatory agencies. Submit two copies of all such submittals to the Architect. Submit the required number of documents directly to the regulatory agency.
- H. MANUFACTURER QUALIFICATION/CERTIFICATION
 - 1. Submit 4 copies of required manufacturer certifications.

SECTION 01340 – SUBMITTALS AND SHOP

I. QUALIFICATION/CERTIFICATION

1. Applicator/Installer Qualification/Certification:

(a.) Applicator/Installer qualification documentation shall consist of a certificate, letter, or other appropriate document issued by a product manufacturer or regulatory agency which states that the company or individual who is applying or installing the product has been trained and is currently certified by the certificate issuer and that product guarantees/warranties will be honored.

(1.) Submit 3 copies of each qualification/certification document.

(2.) All such certifications shall have been issued no less than 3 months prior to the bid opening date.

(3.) Failure to submit certification data within a designated time period or failure to satisfy minimum standards shall be grounds for rejection of the candidate contractor or trade contractor under the terms of the General Conditions for Construction.

(4.) Work which is executed without required certification shall be subject to rejection and complete replacement at the expense of the Contractor. No contract extension shall be granted for rejection of an unqualified or uncertified contractor.

2. Trade Qualification:

(a.) Where identified in other portions of the contract documents, Contractors performing certain portions of the work shall provide written certification of experience and/or other unique qualifications.

(1.) Submit to the Architect 3 copies of a written statement summarizing the contractor's ability to meet requirements specified in the relevant specification sections.

(2.) Where a listing of completed projects is required, include associated contact names and telephone numbers.

(3.) Where manufacturer's certifications are required, submit 3 copies of manufacturer's certification to the Architect for review and approval. Such certificates shall have been issued a minimum of three months prior to the bid opening date.

(b.) Do not proceed with related work until submitted Qualifications and/or Certifications have been reviewed and approved by the Architect. Work executed without prior approval of Qualifications and/or Certifications shall be subject to rejection. No time extensions will be permitted due to the rejection of proposed trade contractors because of failure to meet Certification or Qualification requirements.

(c.) Work executed without approval of required Qualification or Certification submittals will be subject to rejection at the discretion of Architect.

J. TEST REPORTS

1. The results of test reports prepared by the DPS testing consultants or the Contractor or Sub-contractor shall be forwarded to DPS Project Manager, Architect & Contractor by the testing company as soon as results are available. All test reports shall be signed by an officer of the company.

SECTION 01340 – SUBMITTALS AND SHOP

K. OPERATION AND MAINTENANCE MANUALS

1. Submit 2 complete bound sets of Operation and Maintenance Manuals which include (If multiple buildings are within a project; provide individual manuals for each building):
 - (a.) Product Warranty for not less than 24 months.
 - (b.) Manufacturer's complete maintenance instructions including routine and preventive maintenance schedule for each component.
 - (c.) Wiring diagrams and schematics where applicable.
 - (d.) Manufacturer's printed operating instructions.
2. AutoCAD Drawings
 - (a.) AutoCAD 2000 or higher, compatible to the District currently using AutoCAD 2007.
 - (b.) One drawing per CAD file. (No multi-layout files will be accepted)
 - (c.) "As-Built" or "As-Constructed" shall be noted on each drawing.
 - (d.) Naming Conventions
 - (1.) The electronic file name shall be the same as the drawing number (Do not use the prefix with the file name, such as the Consultant's project number).
 - (e.) Use paper space for the title block provided by DPS and model space for the project elements.
 - (f.) Submit all external electronic references, special fonts, images etc... with CAD files.
 - (g.) One As-Printed electronic .PDF of each As-Built drawing in addition to the AutoCAD file.
 - (h.) One 24"x36" (ARCHD) or 30"x42" (ARCHE1) paper size mylar As-Built print of each drawing:
 - (1.) Original As-Built Set
 - (2.) Original Sealed Survey(s)

L. ADDITIONAL SUBMITTALS

- (a.) If not submitted with the As-Built drawing set and applicable, provide one official final approved copy of each of the following As-Built drawings (mylar, AutoCAD and Searchable .PDF file.)
 - (1.) Fire Suppression drawing
 - (2.) Building Automation drawing
 - (3.) Clock Systems drawing
 - (4.) Security Access Control drawing
 - (5.) Surveillance drawing
 - (6.) Security and Fire Alarm Detection drawings
 - (7.) Irrigation As-Built documents
 - (8.) The Contractor shall provide additional data as requested where such information is needed to verify compliance of materials, processes or workmanship with Contract Documents.

SECTION 01340 – SUBMITTALS AND SHOP

1.02 SUBMITTAL PROCESSES

- A. Shop Drawings, Product Data, Samples and other submittals required by other sections of these specifications shall be processed in full compliance with this section.
- B. Coordinate and sequence submittals to avoid delays in the work. Submittals requiring review or selection by the Architect will be acted upon with reasonable promptness. Contractor shall provide a number sequence for submittals to identify submittals and relate them to subsequent submittals.
- C. Identify each submittal with the following information permanently affixed to or noted for each submittal and noted on the submittal transmittal form: name of the project, DPS Project Number, name, address and telephone number of subcontractor, supplier, manufacture and any other second tier contractor associated with the submittal; date, General Contractor, submittal name and number, and Specification Section number governing the submittal. If submittal pertains to more than one spec section, identify each section to which the submittal pertains.
- D. Do not proceed with purchase, fabrication, or installation of submittal related work until marked either "No Exception Taken" or "Make Corrections Noted" by the Architect. Resubmit as required until so marked by the Architect. Work which is executed without required prior review by the Architect shall be subject to rejection. Removal and reconstruction of rejected work shall be at the Contractor's expense.

EDIT NOTE: MODIFY NOMENCLATURE ABOVE AND BELOW TO MATCH LANGUAGE CONTAINED IN A/E REVIEW STAMP

- E. Submittals marked "Submit Specified Item" are so identified to indicate that the item submitted for review is **not** a product or material approved for use in the project. Submittal of one of the approved products or materials is required.
- F. Submittals marked "Revise & Resubmit" shall be changed according to notes attached to the submittal and shall be resubmitted.
- G. Submittals marked "Approved As Noted" shall be considered as approved with the noted items to be corrected before fabrication or erection.
- H. If "Revise & Resubmit" is marked in conjunction with "Approved As Noted" the submittal shall be corrected to reflect needed changes and resubmitted as a record of installed products and/or materials. However, submittals so marked may proceed with manufacture, fabrication, and installation without further Architectural review.

PART 2.00 - CONTRACTOR RESPONSIBILITY

2.01 Under no circumstances shall unreviewed submittals be permitted to be used in conjunction with the work. Work executed without required review and approval by the Architect/ Engineer shall be subject to rejections. Removal and reconstruction of this rejected work shall be at the Contractor's expense.

2.02 Contractor shall number and sequence submittals for easy tracking.

2.03 SUBMITTAL SCHEDULE:

- A. The Contractor shall prepare a schedule of anticipated submittal dates which shall include the date of delivery to the Architect and the date the submittal is to be returned to the Contractor. The schedule shall be approved by the DPS Project Manager, Architect, and Contractor. No adjustments for project delays due to rejection of submittals will be considered.
- B. Refer to Section 01310 for detail requirements regarding scheduling. Incorporation of the submittal schedule into the overall project schedule is required.

SECTION 01340 – SUBMITTALS AND SHOP

2.04 Submission of Shop Drawings, Product Data, and Samples and O&M Manuals shall constitute a representation by the Contractor that he/she has reviewed the submittal and that all measurements, conditions, and relevant criteria of the Construction Documents have been checked, verified, and coordinated. The Contractor shall affix his stamp and signature to the submittal certifying that the items being submitted have been checked for compliance with the contract documents.

2.05 QUALITY ASSURANCE

- A. The Architect's review of submittals is for overall design conformance, color, texture, pattern, etc. The Contractor shall assume full responsibility for dimensional accuracy, quantity, compliance with Drawings and Specifications, performance, errors, and omissions of Submittals. Any and all variations between submittals and Contract requirements shall be specifically identified by the Contractor (in writing on the submittal) at the time of submission. Such variations shall be considered nonconforming work unless specifically waived in writing by the Architect. REVIEW BY THE ARCHITECT SHALL NOT RELIEVE THE CONTRACTOR FROM FULL COMPLIANCE WITH REQUIREMENTS OF THE CONSTRUCTION DOCUMENTS.
- B. Submittals processed by the Architect are not Change Orders. The purpose of submittals is to demonstrate to the Architect that the Contractor understands the design concept, and that such understanding is demonstrated by indicating and detailing the fabrication and installation methods intended to be used.
- C. If deviations, discrepancies, or conflicts between Shop Drawing Submittals and the design drawings/specifications are discovered either prior to or after Shop Drawing Submittals are processed by the Architect, the design drawings/specifications shall control and shall be followed unless specifically approved in writing by the Architect..

2.06 COLOR SELECTION

- A. No color, pattern or texture selections will be made until all samples have been received by the Architect.

2.07 DELIVERY

- A. Unless otherwise noted in writing upon submission to the Architect, Submittals shall constitute an implied statement by the Contractor that submitted items can be fabricated and delivered to the project site without delay to the project schedule.

2.08 QUANTITY OF SUBMITTALS REQUIRED

- A. The Architect requires a minimum of two (3) copies of each submittal for his files. Submittals requiring action by any of the Architect's consultants will require one (1) additional copy for each consultant involved. For submittals larger than 11" x 17", submit one reproducible copy to the Architect, in addition to the minimum quantities specified above.
- B. The Architect will forward one submittal to the DPS Project Manager for review.
- C. The Contractor will maintain one copy of all final "approved" submittals to be delivered to the DPS Project Manager with the Project Closeout Documents, O&M Manuals and Warranties.

PART 3.00 - EXECUTION / INSTALLATION (NO REQUIREMENTS)

END OF SECTION 01340

SECTION 01390 – QUALIFICATION CERTIFICATES

PART 1 GENERAL

1.01 TRADE QUALIFICATION

- A. As identified in other section(s) of these specifications, the Contractor proposed to perform certain portions of the work shall provide written certification of experience and qualifications.
- B. Submit to the Architect a written statement of the proposed Contractor's qualifications, experience, and/or manufacturer's certification to perform identified portions of the work. Except as specifically noted otherwise, required manufacturer's qualification certification shall have been issued and in effect no less than six (6) months prior to the Bid Opening. Refer to individual specification sections for detailed requirements.
- C. Do not proceed with related work until such certification is reviewed and accepted by the Architect. Work which is executed without required prior qualification review by the Architect shall be subject to rejection.

1.02 CERTIFICATION REQUIREMENTS

- A. Failure to submit required certification data within the designated period or failure to satisfy the specified minimum standards for qualification shall be grounds for rejection of the proposed Contractor or Trade Contractor under the terms of the General Conditions of the Contract.
- B. Work which is executed without required Qualification Certification shall be subject to unconditional rejection and complete replacement according to the Specifications at the expense of the Contractor.

1.03 SUBMITTALS

- A. Submittals for Qualification Certification shall conform to the following requirements and procedures:
- B. Submit 3 copies to the Architect for certification, 1 of which will be acted upon and returned to the Contractor.
- C. Refer to Section 01049 - Architect Coordination for outline summary for required Qualification Certification.

1.04 PERFORMANCE REVIEW and BIDDING PRIVILEGES

- A. All General Contractors and Sub-Contractors at any tier may have their performance reviewed by the Denver Public Schools Project Manager and/or the Maintenance Shops. When a contractor receives a poor performance review, he may be excluded from bidding future work for Denver Public Schools.
- B. Process:
 - 1. Contractors and/or sub-contractors will be notified of their performance evaluations and will be given a copy of the evaluation(s) and will be given an opportunity to contest the conclusions of the evaluator.
 - 2. The Executive Director of Facilities Management will be the final judge as to whether a contractor is to be excluded from bidding future work.
 - 3. After a period of one year from the initial date of an unsatisfactory performance decision, the contractor may file with the Executive Director of Facilities Management, a request to be have his unsatisfactory evaluation removed and that the contractor be permitted to resume bidding Denver Schools construction projects. Such a request for a resumption of bidding privileges shall be submitted in the form of a letter of request and shall include:
 - a) Name and Ownership of the firm requesting a change of status

SECTION 01390 – QUALIFICATION CERTIFICATES

- b) Reason(s) why bidding privileges should be restored.
- 4. If the contractor's request for restoration bidding privileges is granted, the Executive Director of Facilities Management will notify the contractor in writing that he may resume bidding on any project that has a mandatory pre-bid conference date after the written notification date.

END OF SECTION 01390

SECTION 01400 – QUALITY CONTROL

PART 1.00 - GENERAL

1.01 WORK INCLUDED

- A. The Contractor is responsible for quality control of the Construction. All acquisition of materials, sequence of construction (except as otherwise indicated), and means and methods of construction shall be the responsibility of the Contractor.
- B. The Contractor shall be responsible for assuring compliance with the quality standards as indicated in the Contract Documents. In addition, the Contractor shall be responsible for:
 - 1. moved to section 01340.Submittal of a Pre-Substantial Completion Report.
 - (a.) Prior to calling for the Architect and Owner to conduct a Substantial Completion Inspection and submit his inspection comments in writing to the Architect and Owner 3 days prior to the scheduled Substantial Completion Inspection.
 - (b.) Inspection process and notifications shall be in accordance with Section 01700 – Contract Closeout .
 - 2. Verification of completion of punch-list items in writing prior to calling for verification inspection by the Architect and Owner.
 - 3. Conduct project and pre-phase meetings with Trade Contractor's for their various parts of the work as detailed below.
 - 4. Conduct progress, substantial completion and final inspections of completed phases of the work during phased construction.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Refer to Section 01700 – Contract Closeout and other sections regarding required QA/QC requirements, record keeping and submittal requirements.

1.03 STANDARDS

- A. Construction tasks shall be performed by craftsmen skilled and experienced in the trades required. Work shall be subject to review by the Architect.
- B. Work and/or materials which fail to meet specified performance, quality, and/or appearance will be rejected and shall be brought into compliance or replaced by the Contractor at no additional cost to the Owner.
- C. Correction or replacement of work which does not meet specified requirements shall not be grounds for an extension of contract period.

1.04 MATERIAL AND WORKMANSHIP

- A. Unless otherwise specified, or indicated on the drawings, material shall be new, of quality specified, and delivered in an undamaged condition at Substantial Completion..
- B. The Work shall be performed in a thorough workmanlike manner by qualified, and skilled mechanics, acceptable to other trades involved on the job requiring acceptable substrate for the performance of their work.

1.05 DRAWINGS AND FIELD MEASUREMENTS

- A. The Contractor shall verify dimensions which may affect the assembly of various parts of the project. Discrepancies between actual and designed dimensions which materially affect the function or appearance of an area shall be reported to the Architect.

SECTION 01400 – QUALITY CONTROL

1.06 PRE-INSTALLATION / PRE-PHASE MEETINGS

- A. The Contractor shall schedule and coordinate a pre-installation / pre-phase meeting to be held before work under each specific trade or sub-contract begins in accordance with Section 01200 - Project Meetings requirements.

END OF SECTION 01400

SECTION 01410 – TESTING LABORATORY SERVICES

PART 1 GENERAL

1.01 QUALITY ASSURANCE

- A. The Contractor is responsible for complying with the requirements of the Contract Documents. Testing performed by the Owner's Agents shall not be relied upon by the Contractor as sufficient to assure compliance with the Contract Documents. The Contractor shall procure and pay for testing necessary to assure that the construction is in compliance with the Contract Documents.

1.02 TESTING

- A. Testing Laboratory and/or Engineering services are required for quality control in portions of the work identified in other sections of these specifications. The Contractor shall provide all materials required for testing at no additional cost.
- B. Tests required by these Specifications shall be performed in strict accordance with referenced testing methods, procedures, and conditions. Pertinent data shall be included in clear, comprehensive written forms according to the Architect's or Engineer's requirements.

1.03 COST OF TESTING

- A. Unless indicated otherwise, Owner's testing shall be performed by the Owner's authorized agents, at the Owner's expense.
- B. Costs for re-testing of non-complying work shall be borne by the Contractor.
- C. According to the judgment of the Architect, ANY portion of the work in this contract may be tested at any time for any reason. Costs for such testing shall be borne by the Contractor only if such tests indicate that work does not meet Contract Document requirements.

1.04 EQUIPMENT TESTING

- A. Equipment testing shall be as determined appropriate by the Owner to assure proper performance according to the manufacturer's specifications for each equipment item.
- B. After all utility connections to equipment are completed; the Contractor shall conduct final tests of equipment in presence of Architect, Owner, and/or their duly authorized representative(s).
- C. Unless waived in writing by the Owner, the requirements of this section shall apply to all installed equipment items having utility connections.

1.05 ARCHITECT NOTIFICATION

- A. The Contractor shall be responsible for notifying the Architect at least three (3) working days prior to commencing work which is identified as requiring testing.

1.06 COORDINATION

- A. Refer to Section 01049 - Architect Coordination for related requirements and outline of required testing and laboratory services.

SECTION 01410 – TESTING LABORATORY SERVICES

1.07 SUBMITTALS

A. TEST REPORTS

- B. Test reports, whether performed for the Owner or the Contractor, shall be submitted to the Architect, Owner and Contractor as soon as results are available. Reports shall be clear, concise, comprehensive written forms containing required test results.

END OF SECTION 01410

SECTION 01510 – TEMPORARY UTILITIES

PART 1 GENERAL

- 1.01 The Contractor shall arrange for all temporary utilities needed for construction and shall pay all fees and charges related to such utilities.
- 1.02 UTILITIES AVAILABLE TO THE CONTRACTOR: The following utilities in the existing building will be made available for the Contractor's use in the performance of work in this Contract:
- A. A/E to list utilities available for Contractor use.
 - B. The Contractor may use indicated utilities, provided the Contractor supplies all materials, equipment, and labor required to extend the utility to the work area, and provided the Contractor removes such extensions at the end of each work day (unless otherwise arranged).
 - C. Any modification of existing utilities to meet the Contractor's needs is not permitted without the written consent of the DPS Project Manager.
 - D. The Contractor shall protect any and all existing utilities which may be utilized by him in the performance of his work.
 - E. No utility shall be overloaded or subjected to usage in excess of the normal usage expected for such utility. The Contractor shall perform such tests as are necessary to determine existing loads and spare capacities so that construction usage can be appropriately sized.
- 1.03 **USE OF EXISTING TOILETS FORBIDDEN**
- A. The use of new and/or existing sinks, toilets, lavatories, etc. by construction personnel is strictly prohibited. The Contractor shall provide temporary toilets as required for health and sanitation.
 - B. The DPS Project Manager may permit use of existing toilet facilities for minor remodel projects. The Architect shall consult with the DPS Project Manager on such projects and shall include restrictions, etc. in this section.
- 1.04 **USE OF OTHER BUILDING SYSTEMS:**
- A. The Contractor may not use any other building systems for construction assistance unless specifically approved in writing by the DPS Project Manager. Use of elevators, phones, fax machines, etc. are included in this area.
- 1.05 **TEMPORARY HEAT**
- A. The Contractor shall provide temporary heat during construction as required by the various sections of the specifications or as needed to assure that work is performed under environmental conditions which are appropriate. Protect the work from damage during cold weather by the judicious application of acceptable temporary heating methods.
 - B. **USE OF PERMANENT HEATING EQUIPMENT**
 - 1. Permanent heating units may be used for temporary heating purposes provided:
 - (a.) The Contractor makes request and receives approval from the Architect and Owner.
 - (b.) The building is completely enclosed.
 - (c.) Heating unit has sufficient vents, ducts, etc. to make it safe to operate.
 - 2. Units and ductwork used for temporary heat shall be cleaned and placed in first-class working order prior to final acceptance of the project.
 - 3. Use of the units for temporary heat shall not reduce the mandatory warranty period of twenty-four months from the date of substantial completion.

SECTION 01510 – TEMPORARY UTILITIES

C. UTILITY COSTS

1. The Contractor shall obtain all utilities and shall pay all utility charges except as otherwise specified.
2. Use of permanent metering for temporary utilities shall not be allowed unless approved by the Architect.

PART 2 PRODUCTS

- 2.01 Use of permanent metering for temporary utilities shall not be allowed unless approved by the Architect.
- 2.02 Temporary heating units shall be in good repair and shall be maintained in good operating condition during their use. All temporary heating units must be tested and labeled by U.L., F.M., F.I.A. or other recognized organization related to the fuel being consumed.
- 2.03 Salamander or open burning temporary heating units shall not be used.

PART 3 EXECUTION

3.01 MAINTENANCE

- A. Maintain all temporary heating equipment for safe and efficient operation. Provide adequate ventilation to prevent condensation and to provide adequate combustion air.
- B. Comply with all requirements of governmental agencies having jurisdiction.
- C. Maintain all temporary utilities in safe condition.

END OF SECTION 01510

SECTION 01520 – TEMPORARY CONSTRUCTION

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Temporary construction required for general prosecution of the work.
- B. Temporary construction and procedures to accommodate temporary exiting and safety requirements to permit construction to occur without compromising the safety or function of adjacent occupied spaces.

1.02 RELATED WORK

- A. N/A

1.03 REGULATORY REQUIREMENTS

- A. All temporary construction shall be installed and maintained in compliance with the regulations of appropriate governmental agencies.

1.04 PERMITS

- A. Contractor shall acquire all permits required for erection of barriers in public ways.

1.05 BARRIER PERFORMANCE AND MONITORING

- A. Barriers shall be erected where isolation of noise, odors, dust, heat or other objectionable effects of construction may compromise the safety, operation or comfort of adjacent occupied spaces.
- B. Temporary heat, welding or any other operation which could produce objectionable effects on adjacent occupied spaces shall be mitigated through the use of barriers, equipment or other appropriate methods. The Contractor shall provide all such protection whether or not temporary barriers are indicated in the Contract Documents.
- C. The Contractor shall provide all necessary monitoring, including required equipment, to assure compliance with the requirements of this section.

1.06 CONSTRUCTION FENCING

- A. The Contractor shall erect and maintain a construction fence throughout the construction period. The construction fence shall enclose an area sufficient to completely enclose all of the Contractor's work area including space for staging, stockpiling of materials, field offices, storage trailers and sheds.
- B. The Construction Fence shall be removed at the completion of construction. Damaged or disturbed soils shall be re-graded and compacted as specified.
- C. Existing or permanent fencing shall not be utilized to satisfy construction fencing requirements unless approved in writing by the DPS Project Manager.

1.07 PROTECTIVE BARRIERS

- A. The Contractor shall erect suitable barriers for the protection of workers and the general public from construction hazards.
- B. Barriers shall be accompanied by appropriate signs and/or markings for the identification of hazards.
- C. Barriers requiring engineering (i.e. protection from overhead falling objects, etc) shall be designed by a registered engineer.
 - 1. Engineering of Barriers
 - a) The Contractor will pay for the engineering of all barriers.
 - b) A stamped submittal of all Engineered Barriers shall be submitted to the Architect for review.

SECTION 01520 – TEMPORARY CONSTRUCTION

1.08 DUST, NOISE AND ENVIRONMENTAL HAZARD CONTAINMENT BARRIERS

- A. The Contractor shall erect barriers suitable for the containment of environmental hazards. Environmental hazard containment barriers shall be constructed and maintained in compliance with the requirements and regulations of local, state and federal regulatory agencies.
- B. The Contractor shall provide dust and sound proof enclosures between existing buildings and work areas.

1.09 TEMPORARY DOORS AND CLOSURES

- A. Where new construction abuts existing occupied buildings, a tight fitting, dust and sound resistant door or temporary enclosure shall be installed at each connecting opening.
- B. Closures shall be capable of achieving a sound transmission coefficient (STC) of 35 and shall have a 25 (maximum) flame spread rating.
- C. The occupied side of the closure shall be painted and finished.

1.10 TRAFFIC ROUTING

- A. Pedestrian and/or vehicular traffic shall not be impeded by operations conducted in the execution of this Contract, except as permitted in writing prior to construction.
- B. Closures and alternate routing of traffic shall be performed in full compliance with the laws, regulations, and procedures of governing authorities, applicable codes, and regulations.

1.11 ROOF ACCESS BARRIERS

- A. Roof access ladders and scaffolding shall be removed at the end of each work day, unless suitable barriers are provided to prevent access.

1.12 EXITING

- A. The Contractor shall construct safe egress passages as required where any required exit is made unsafe or unusable due to construction activities.
- B. In lieu of constructing alternate means of egress and circulation, the Architect may permit coordination of construction into phases to permit partial use of construction areas at all times.
- C. The Contractor shall submit to the Architect and the DPS Project Manager his plans for the safe exiting of building occupants during various construction activities.

1.13 MAINTENANCE OF BARRIERS

- A. Barriers shall be maintained in place for the duration of need.
- B. Barriers shall be maintained by the Contractor so that their functions are not compromised at any time.
- C. Contractor shall obtain approval in writing from the DPS Project Manager prior to removal of any temporary barriers.
- D. When temporary barriers are removed, the Contractor shall repair any damage to the surrounding construction with no noticeable differences in appearance.

1.14 SHORING AND BRACING

- A. Where construction requires temporary shoring or bracing of excavations, beams, columns, etc. during erection, demolition, cutting, etc., the Contractor shall provide such temporary construction of type and configuration appropriate for the task.
- B. Should engineering be required for temporary shoring or bracing, the Contractor shall acquire and pay for such engineering.

SECTION 01520 – TEMPORARY CONSTRUCTION

PART 2 MATERIALS

A. Construction Fencing

1. The Construction Fence shall be 6'-0" in height (minimum).
2. Fence construction and materials shall be adequate to prevent unauthorized entry into the contract area.
3. Plastic snow fencing or warning tape are not acceptable materials.

PART 3 INSTALLATION/APPLICATION/ERECTION

3.01 Contractor shall erect and maintain barriers to provide continuous effective hazard protection. Minimum standards of governing agencies shall be followed.

3.02 BARRIER PERFORMANCE AND MONITORING

- A. Barriers shall be erected wherever isolation of noise, odors, dust, heat or other objectionable effects of construction may compromise the safety, operation or comfort of adjacent occupied spaces.
- B. Temporary heat, welding or any other operation which could produce objectionable effects on adjacent occupied spaces shall be mitigated through the use of barriers, equipment or other appropriate methods. The Contractor shall provide all such protection whether or not temporary barriers are indicated in the Contract Documents.
- C. The Contractor shall provide all necessary monitoring, including required equipment, to assure compliance with the requirements of this section.

END OF SECTION 01520

PART 1.00 - GENERAL

1.01 TRAFFIC ROUTING

- A. Pedestrian and/or vehicular traffic shall not be impeded by operations conducted in the execution of this Contract, except as permitted in writing prior to construction.
- B. Closures and alternate routing of traffic shall be performed in full compliance with the laws, regulations, and procedures of governing authorities, applicable codes, and regulations.

1.02 PROTECTIVE BARRIERS

- A. The Contractor shall erect suitable barriers for the protection of workers and the general public from construction hazards.
 - 1. Barriers shall be accompanied by appropriate signs and/or markings for the identification of hazards.
 - 2. Barriers requiring engineering (i.e. protection from overhead falling objects, etc) shall be designed by a registered engineer.
 - (a.) The Contractor will pay for the engineering of all barriers.
 - (b.) A stamped submittal of all Engineered Barriers shall be submitted to the Architect for review.
 - 3. Barriers shall be maintained by the Contractor so that their functions are not compromised at any time.

1.03 ROOF ACCESS BARRIERS

- A. Roof access ladders and scaffolding shall be removed at the end of each work day, unless suitable barriers are provided to prevent access.

1.04 EXITING

- A. The Contractor shall construct safe egress passages as required where any required exit is made unsafe or unusable due to construction activities.
- B. In lieu of constructing alternate means of egress and circulation, the Architect may permit coordination of construction into phases to permit partial use of construction areas at all times.
- C. The Contractor shall submit to the Architect and the DPS Project Manager, his plans for the safe exiting of building occupants during various construction activities.

1.05 DUST, NOISE AND ENVIRONMENTAL HAZARD CONTAINMENT

- A. The Contractor shall erect barriers suitable for the containment of environmental hazards. Environmental hazard containment barriers shall be constructed and maintained in compliance with the requirements and regulations of local, state and federal regulatory agencies.
- B. The Contractor shall provide dust and sound proof enclosures between existing buildings and work areas.
- C. Barriers shall be maintained in place for the duration of need.

1.06 PERMITS

- A. Contractor shall acquire all permits required for erection of barriers in public ways.

SECTION 01530 – BARRIERS AND ENCLOSURES

PART 2.00 - PRODUCTS

2.01 MATERIALS

- A. 6' knuckled chain link panel fencing

PART 3.00 - INSTALLATION

3.01 INSTALLATION/APPLICATION/ERECTION

- A. Contractor shall erect and maintain barriers to provide continuous effective hazard protection. Minimum standards of governing agencies shall be followed.

END OF SECTION 01530

SECTION 01540 – SECURITY

PART 1 GENERAL

1.01 SECURITY

- A. Work areas shall be secured at the end of each working day and at other times when construction areas are not manned. The Contractor shall install temporary doors, windows, or other closures as needed to prevent the entry of unauthorized personnel. Provide adequate locking mechanisms for security closures.
- B. Existing security provisions may be used provided those provisions are adequate to prevent the entry of unauthorized personnel.
- C. The security of connecting or adjacent existing structures shall not be compromised by the Construction. The Contractor shall provide adequate fencing, barriers, barricades, etc. necessary to maintain building security.

1.02 SECURITY CLOSURES AND BARRIERS

- A. Security closures and other barriers shall be coordinated with other barrier (wind, dust, noise, etc.).
- B. Security closures shall be of substantial construction and shall be constructed so as to provide the same security level as the remainder of the building.
- C. Security closures and barriers shall not interfere with building exiting requirements.

1.03 NIGHT WATCHMAN

- A. If the Contractor desires to place a night watchman on the premises, the person shall be approved by DPS Security and shall be bonded as required by DPS.

1.04 CONTRACTOR'S SECURITY

- A. Security requirements for Contractor's property is the exclusive responsibility of the Contractor and his means are not subject to this specification unless Contractor's requirements affect DPS property.

END OF SECTION 01540

SECTION 01561 – CONSTRUCTION CLEANING

PART 1 GENERAL

1.01 REGULATORY REQUIREMENTS

A. Pollution Control

1. Conduct all cleaning operations in compliance with governing authority regulations. Comply with all local ordinances, State and Federal Laws and statutes. Prohibitions include, but are not necessarily limited to:

- a) Burning or burying of waste materials on the project site.
- b) Disposal of flammable liquids, acids, caustics or other hazardous materials by dumping on site or into sanitary sewers, storm sewers, streets or gutters.

1.02 PROJECT/SITE CONDITIONS

- A. Temporary site storage of construction waste shall be in suitable containers. All waste storage shall be housed within the construction fencing.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Materials used to clean manufactured products shall be acceptable to and recommended by the product manufacturer.

B. EQUIPMENT

1. Equipment used to clean surfaces shall be appropriate to the surface being cleaned.

PART 3 EXECUTION

3.01 PROTECTION (SURROUNDING AREAS OR SURFACES)

- A. Protect all surrounding surfaces which could be damaged by cleaning operations. Remove all protective coverings when cleaning is complete.

3.02 CLEANING

- A. Clean all construction areas of waste materials at the end of each work day. Completed areas shall be broom cleaned immediately after completion (while awaiting final cleaning).

3.03 REMOVAL

- A. Remove from site and properly dispose of all waste concrete, mortar, or other debris no less frequently than once per week.

END OF SECTION 01561

SECTION 01580 – PROJECT IDENTIFICATION AND SIGNS

PART 1 GENERAL

1.01 QUALITY ASSURANCE

- A. Onsite, locate a high traffic and visible location to maximize public awareness of the project. If there are any questions on where to locate a sign, please see the Community Relations Manager.
- B. Stake two black painted posts into the ground, spaced to accommodate the width of the sign.
- C. Using the grommet holes, mount the sign to the face of the posts.
- D. Recommend bottom of sign be 36" above grade.

END OF SECTION 01580

SECTION 01590 – FIELD OFFICE SHEDS

PART 1.00 - GENERAL

1.01 FIELD OFFICES

- A. Temporary Contractor office facilities at the site are a requirement of this Contract.
- B. The Contractor's Field Office will not be permitted to occupy space within any existing school structures or within incomplete portions of building(s) under construction unless authorized in writing by the DPS Project Manager.

1.02 CONTRACTOR'S OFFICE FACILITIES

- A. The Contractor's field office shall be weather tight, heated and suitable for the conduct of the Contractor's business and to conduct required construction meetings.
- B. The Contractor's office shall be equipped with a telephone, fax machine and such other amenities as are necessary for the conduct of the Contractor's business.
- C. The Contractor's office equipment shall be available for reasonable use by the Architect, Owner and their consultants when conducting project business.
- D. Contractor shall provide a conference table and adequate number of chairs to accommodate field meetings and pre-phase meetings.

1.03 ARCHITECT'S/OWNER'S OFFICE (Projects over \$3,000,000 in construction value).

- A. The Contractor shall provide, at his expense, an office facility at the site for the use of the Architect, the DPS Project Manager and their authorized representatives.
- B. The office shall have a secure door with locking mechanism, lighting, heating, electric power, and separate telephone service.
- C. The Office shall be equipped with two chairs and a plan table of 3' x 7' minimum dimensions.
- D. The Architect/Owner Office shall be near the Contractor's field office.

END OF SECTION 01590

SECTION 01620 – STORAGE AND PROTECTION

PART 1 GENERAL

1.01 WORK BY OTHERS

- A. The Owner may provide materials or equipment to the project site as indicated in the Contract Documents. The Contractor shall receive such materials and shall provide for the proper storage of the material prior to its being incorporated in the Work. The Contractor shall inspect all such deliveries immediately after receipt and shall notify the Owner and Supplier of any defects which are apparent.

1.02 RECORDS RETENTION

- A. Contractor shall prepare and maintain a matrix of manufacturer's recommended storage and maintenance requirements including storage temp, shelf life, and frequency of scheduled maintenance for stored products.
- B. Compliance with the manufacturers recommended maintenance shall be recorded in the matrix to provide documentation that storage and maintenance requirements are being met.
- C. Contractor shall provide copies of the matrix to the Owner upon request.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 PROTECTION

- A. The Contractor shall provide for the proper storage of all products and materials whether on the project site or at a remote location. The Contractor shall obtain from materials suppliers, product data specifying the environmental conditions suitable for the storage of the particular product. Proper storage includes all temporary heat, weather protection, sunlight protection, etc. as necessary to preserve the properties of the product prior to installation or application.
- B. Interim maintenance issue including lubrication and rotation of shafts shall be performed according to the manufacturer's written instructions at a frequency recommended by the manufacturer.
- C. Maintenance of stored and installed equipment shall continue until the date of substantial completion.
- D. Document all interim maintenance performed and provide this documentation to the Architect and Owner at Substantial Completion.

3.02 PROGRESS MEETING REPORTING

- A. Contractor shall provide a list of newly received products and manufacturer's storage requirements and present same at regular project progress meetings.
- B. Contractor will be responsible for manufacturer's warranty if storage and pre-acceptance maintenance requirements have not been met and/or cannot be documented.

END OF SECTION 01620

SECTION 01625 – PROTECTION OF WORK AND PROPERTY

PART 1.00 - GENERAL

1.01 WORK INCLUDED

- A. The Contractor shall provide all materials, equipment and labor necessary to protect the Owners property from damage due to Construction activities. Newly constructed work, unincorporated products & materials, and existing structures shall all be afforded suitable protection.

1.02 PROTECTION

- A. All portions of the site and existing structures or landscaping are intended to remain undisturbed unless otherwise indicated.
- B. The Contractor shall protect all sidewalks, curbs and gutters and streets adjacent to the property.
- C. The Contractor shall locate all underground utilities and maintain suitable markings to identify their location. All buried utilities including lawn sprinkler systems shall be preserved during the progress of the work unless otherwise indicated.
- D. Contractor shall physically locate all buried utilities within 20' of proposed excavations by potholing.

PART 2.00 - PRODUCTS (NOT USED)

PART 3.00 - EXECUTION

3.01 INSPECTION

- A. The Contractor shall identify existing substandard conditions in writing prior to beginning the work, or assume responsibility for the correction of such conditions under the terms of this section.
- B. The Architect and the DPS Project Manager will verify substandard existing conditions identified by the Contractor.

3.02 PROTECTION OF WORK AND PROPERTY

- A. Demolition, construction, and other operations performed in the course of the work shall not cause deterioration or damage to other adjacent property or utilities, public or private, directly or indirectly.
- B. The Contractor shall notify the Architect and DPS immediately when any new construction or existing building or grounds elements are damaged through fire, water, wind, vandalism or construction activities.
- C. Construction operations shall be performed so as to minimize and control dust, dirt, and noise within reasonable limits.
- D. Existing sod, trees, plants, bushes, ground cover, and landscaping (not scheduled for removal) shall be protected or fully restored or replaced upon completion of construction operations. Plant materials shall be replaced with the species and sizes matching damaged items.
- E. Construction not specifically required to be modified or removed for work under this contract and construction labeled "to remain" shall remain undisturbed throughout the execution of the work. The Contractor shall provide all appropriate means of protection necessary for accomplishment of this objective. Provide protection from natural elements as required.

SECTION 01625 – PROTECTION OF WORK AND PROPERTY

- F. The Contractor shall provide, install, and maintain all shoring, bracing, and other temporary construction necessary for the protection of existing construction to remain undisturbed and as required for the safety of personnel and public.

3.03 DAMAGE CAUSED BY UTILITY INTERRUPTION

- A. Where construction activities require interruption of building systems and/or utilities, the Contractor shall take measures required to prevent the damage of building systems and materials
 - 1. Contractor shall arrange and pay for any hand watering required to sustain plant materials whenever construction activities interrupt irrigation systems.
 - 2. Contractor shall arrange and pay for temporary power to maintain refrigeration systems when perishable foods may be at risk of deterioration.
 - 3. Contractor shall notify Architect and Owner 1 week in advance of planned power outages so that potential risks can be identified.

3.04 REMEDIES

- A. The Contractor shall be fully responsible for the replacement, restoration, repair, or cleaning of any damage or loss incurred as a result of damage caused by construction activities. Replacement and repair activities shall result in the restoration of damaged areas to conditions existing at the start of construction. At the discretion of the Owner, an equitable settlement value may be established in lieu of correction of damage or loss. This amount shall be deducted from the Contract Amount by Change Order.
- B. Mechanical and electrical equipment required to be removed and reinstalled to accommodate work in the Contract shall be handled with the greatest of care and restored to full operation and function. The Contractor shall notify the Architect immediately in writing if any product intended for relocation and reuse cannot be removed and re-installed without damage which will render it unable to function as intended.
- C. The Contractor shall comply with verbal and written instructions of Loss Control Agents of the Owner's Insurer to minimize potentially hazardous procedures and conditions.
- D. The Contractor shall take precautions to protect existing concrete and asphalt pavement from damage due to vehicle loads, parking, and storage.
- E. The Contractor shall schedule loading to take advantage of pavement material consolidation during cooler temperatures. Minimize loading paved areas during hot weather. Employ plywood (or other suitable method) to distribute wheel loads to the greatest extent possible.
- F. All existing irrigation systems are considered to be fully operational. All damage to sprinkler systems in the vicinity of construction (unless documented as pre-existing) shall be repaired by the Contractor at no additional cost to DPS. Inspections and/or tests of the existing system shall be conducted by the Contractor in the presence of the DPS Project Manager, in order to establish performance criteria for the reinstalled system. Except as waived in writing by the Architect, the performance of the reinstalled system shall be equal to the existing system. The Contractor shall give written notice to the Owner and the Architect prior to dismantling of the existing underground sprinkler systems.
- G. Damaged lawn areas whether damaged by construction activities or lack of water, shall be restored by proper soil preparation and treatment, grading, filling, and the laying of new sod (seeding is not permitted).

SECTION 01625 – PROTECTION OF WORK AND PROPERTY

3.05 SCHEDULES

- A. The Contractor shall coordinate work between the various trades and with the Owner and shall provide a schedule of Utility interruptions needed to the Owner. The Owner will review such schedule and direct such modifications as may be needed for the continued operation of the facility.
- B. The Contractor shall notify the Owner whenever lawn sprinkling systems must be deactivated and for what duration of time the system must remain shut off.

END OF SECTION 01625

SECTION 01630 – PRODUCT OPTIONS AND SUBSTITUTIONS

PART 1.00 - GENERAL

- A. The words "**or equal**" and "**or equivalent**" are applicable to all Specifications and Drawings relating to materials, products or equipment specified. Any material, product, or equipment which will fully perform the duties specified will be considered for approval as "a substitute", provided the Contractor submits proof that such material, product or equipment is of acceptable equivalent substance and function and is accepted by the Architect by addendum **prior to the bid opening**.
- B. No requests for substitutions will be considered after the request for approval deadline. Contractor is responsible to determine suitability of approved substitute products for general construction purposes and scheduling requirements.
- C. Whenever a material or article is specified or described by using the name of a proprietary product or the name of a particular manufacturer or vendor, the specific item mentioned shall be understood as establishing type, function, dimension, appearance, and quality desired. Other manufacturer's products will be considered provided sufficient information is submitted to allow the Architect to determine whether products proposed are acceptable for use in project.
 - 1. Requests for substitutions must clearly state what is offered and be complete with full data, including illustrations, specifications, capacities, operational data and samples..
 - 2. Requests for Architect's acceptance of substitute products for those specified shall be according to the following:
 - (a.) Requests in writing shall be received by the Architect at least seven (7) working days **prior** to the bid opening.
 - (b.) Detailed, complete information for a **specific** product must be provided with each request in order to permit accurate evaluation. Submissions consisting only of general catalogues or vague, incomplete data will not be considered.
- D. It is the duty of the party making the request to provide sufficient information with the request. The Contractor shall identify each individual specified item and proposed substitute.
- E. The burden of proof of acceptability rests with the Contractor.
- F. Requests for approval of substitute items shall be categorically rejected if received after specified deadlines or if non-compliant with any conditions of this section or specification section of the product for which substitution approval is being requested..
- G. Acceptance of substitutions shall in no way be interpreted as a waiver from full compliance with other specification requirements, unless requests for approval of substitute items specifically request relief from specified requirements and the requested relief is specifically granted in the approving addendum.
- H. Rejection of a Request for Substitution may be for any reason including: product incompatibility, past record of performance for DPS, parts availability, manufacturer's representative's service performance, available colors or finishes or any other factor which impacts the aesthetics, maintainability, durability or serviceability of the product. Acceptability of proposed substitutions is at the sole discretion of the Owner.

1.02 SAMPLES

- A. Samples shall be provided for substitution requests of:
 - 1. Casework
 - 2. Carpet

SECTION 01630 – PRODUCT OPTIONS AND SUBSTITUTIONS

3. Chalkboard, Tackboard, Markerboard (trim only).
4. Windows
5. Samples may be requested for any other items if in the judgment of the Architect and/or Owner, such samples are needed to adequately judge acceptability.

1.03 UTILITY REQUIREMENTS:

- A. Any differences in utility requirements, hook up, fabrication, or construction between specified items and proposed substitutions shall be clearly identified in writing by the party making the request for approval of equals.
- B. When the Architect accepts a product proposed by a supplier as being "equal" to a product specified in the Contract Documents and such proposed product requires a different quantity and/or arrangement of any other part of the work from that specified, detailed, stated in the Approval, or indicated on the Contract Documents, the Contractor shall provide the same at his own cost and expense.

1.04 NOTIFICATIONS

- A. Materials and equipment accepted as substitutes for specified products will be listed in Addenda and distributed to all Construction Document holders of record. No other notification of the Architect's approvals will be issued. The Architect will not list products that are not accepted as substitutions.

PART 2.00 - APPROVED MANUFACTURERS

- A. Where various sections of these specifications list manufacturers as acceptable to provide products specified, the naming of a manufacturer herein:
 1. Indicates that said manufacturer is approved to provide a product that meets the detailed specified requirements. Acceptance of the manufacturer does not suspend any requirements of the specification unless specifically indicated in the authorizing addendum..
 2. Approval does not indicate any judgment on the capacity of the manufacturer to produce the quantity of product required for any specific project. The Contractor shall be responsible for determining the ability of any particular manufacturer to fulfill contractors delivery schedules, etc. as needed to complete the contract within the given contract time.

END OF SECTION 01630

SECTION 01690 – PROPRIETORSHIP OF SALVAGEABLE MATERIALS

PART 1 GENERAL

1.01 SALVAGEABLE MATERIALS

- A. Documentation of the original condition of materials to be salvaged for the Owner or for reinstallation shall be the responsibility of the Contractor. Undocumented damage shall become the responsibility of the Contractor and the Contractor shall make necessary repairs to these items before delivery to the Owner or reinstallation in the project.
- B. All materials shown to be removed and not indicated to be reinstalled or otherwise salvaged for the Owner become the property of the Contractor. The Contractor shall salvage for his use or dispose of all such material off site in a legal manner.
- C. Where items are indicated to be salvaged for the Owner, those items remain the property of the Owner, the Contractor shall move items to a designated location. Verify exact locations with the DPS Project Manger.
- D. Where items are indicated to be partially salvaged by the Owner, the Contractor shall deliver those items to a designated location for partial salvage by the Owner. After an agreed upon time for Owner salvage has passed, the Contractor shall take possession of remaining materials and remove them from the project site and dispose of them in a legal manner.

PART 2 SCHEDULE OF SALVAGEABLE MATERIALS

Item	Disposition (refer to descriptions)
Wood shelving (2)	Remove by Contractor – reuse in final construction
Exterior table with benches (4)	Remove by Contractor - relocate and install in final construction

PART 3 DELIVERY, STORAGE, AND HANDLING

- A. Salvaged materials shall be handled with care and deposited in identified storage areas in an undamaged condition.
- B. Maintain salvaged materials, clean and store and preserve materials in existing condition until reuse, delivery to or collection by Owner, or removal from site by Contractor.

END OF SECTION 01690

PART 1 GENERAL

1.01 Final review and closeout procedures for this project shall be as follows:

- A. When the Contractor believes that all work is complete, the Contractor shall personally inspect the work to certify completion of all contract requirements. The Contractor shall then notify the Architect, IN WRITING, of project completion, and list outstanding or incomplete items required by the contract. Such written notification shall constitute the Contractor's certification of inspection, acceptance, and suitability of the work for the Architect's review. Before requesting an inspection, the Contractor shall have submitted to the Architect:
 - 1. All shop drawings, submittals and product data as required by the Contract Documents.
 - 2. All reports and test results as required by the Contract Documents (i.e. air balance reports, concrete test reports, etc.)
 - 3. Inspection reports and certificates of agencies having jurisdiction.
 - 4. Price quotations for any outstanding change orders, bulletins, or claims.
 - 5. Schedule and perform all training required by the Contract Documents.
- B. The Contractor shall notify all applicable regulatory agencies that the project is complete and ready for final inspection, etc. Notifications shall include:
 - 1. State of Colorado, Division of Oil & Public Safety
 - 2. Denver Building Department
 - 3. State of Colorado Plumbing Board
 - 4. State of Colorado Electrical Board
 - 5. Denver Health and Hospitals.
 - 6. Denver Wastewater Management
 - 7. City and County of Denver Zoning Department
 - 8. Any other agencies having jurisdiction.
- C. Within five (5) days of receipt of a request for inspection (and all required submittals and report(s)), the Architect will schedule a final inspection. The inspection will be attended by the Architect, the Architect's Consultants, DPS Project Manager, DPS QA-QC, the General Contractor and major Sub-Contractors. A punch-list of work to be accomplished before acceptance of the project will be prepared by the Architect and distributed to all concerned parties.
- D. At the time of final inspection, the Contractor shall turn over all mechanical systems and utility responsibilities to the Owner. If the building has been occupied prior to final inspection, the Contractor will turn over systems at that time.

1.02 KEYING INSPECTION

- A. Unless otherwise arranged, at the time of final inspection the Contractor shall provide all keys at the project site. A full inspection of all locks and keying will be conducted by the Contractor and Owner at that time. At the completion of the Keying Inspection, all keys will be turned over to the Owner's Project Manager.
- B. Within 30 calendar days of the issuance of the final punch list, the Contractor shall have completed all punch list items. At that time, the Contractor shall advise the Architect in writing that the work has been thoroughly inspected and is ready for final acceptance. Before a final acceptance review is conducted, the following shall be submitted to the Architect:

SECTION 01700 – CONTRACT CLOSEOUT

1. A set of drawings marked to reflect variations between original drawings and as-built conditions.
2. A log of all subcontractors, and a log of all materials and product suppliers. Include addresses and phone numbers of each party.
- C. Within ten (10) days of receipt of above notification and submittals, the Architect will schedule an acceptance review.
- D. If all punch-list items have been completed to the satisfaction of the Architect and Owner, the Architect will recommend acceptance of the project.
- E. If the Owner elects to accept the project without completion of all punch-list items, an amount equal to three (3) times the value of incomplete work will be held from subsequent pay requests until items have been completed.
- F. The Contractor shall then submit to the Architect:
 1. All Guarantees and Warranties required by the Contract Documents. All Guarantees and Warranties shall bear the final completion date.
 2. Final Application for Payment.
 3. No additional payments will be made if certificate of occupancy (or certificate of compliance) has not been provided.
 4. Consent of surety to final payment.
 5. Certificate of Occupancy.
 6. Operating and maintenance manuals for all equipment and products as required by the Contract Documents.
 7. Documentation of Training required by the Contract. Documentation shall consist of copies of written material, video tapes, etc. which indicate the scope and detail of the various training sessions. Contractor to include names of all personnel trained.
- G. Following acceptance, the School District will issue a Notice of Final Settlement to the Contractor, setting the date for Final Settlement. Notice of Final Settlement will be published no less than twice during this period.
- H. Upon receipt of the preceding items, the Architect will recommend final payment including retainages.
- I. All closeout related documents, submittals, and required paperwork shall be delivered to the Architect AT ONE TIME for each phase of closeout.

1.03 PHASED PROJECT CLOSEOUT

- A. Where construction occurs in various buildings or separated sites, the Contractor may request a phased closeout. Such phased closeout shall follow the procedures outlined above except that items F through I shall not occur until all phases have reached completion.

**DPS Facility Planning / Archives Plan Room
Close-Out Documentation and As-Builts to include:**

1. AutoCAD 2000i or higher; comparable to the District currently using AutoCAD 2011.
2. For Electronic files; ONE Drawing per CAD file to be created. No multi-layout files will be accepted.
3. “As-Built” or “As-Constructed” shall be noted on each drawing. Correct building name and address shall appear in titleblock.
4. Naming Convention:
 - a. The electronic file name shall be the same as the drawing number.
(Do not use a prefix within the file name, such as the Consultant’s project number.)
5. User paper space for the title block provided by DPS and model space for the projects elements.
6. Submit ALL external references, special fonts, images, etc... with CAD files.
7. Submit Word and/or Excel electronic files for:
 - a. Any and all specification if created
 - b. Any and all Operations/Maintenance Manuals if created
8. Option: One as-printed electronic PDF of each as-built drawing in addition to the AutoCAD file.
9. One [24” x 36”] or [30” x 42”] edge to edge paper size mylar As-Built print of each drawing: If Multiple buildings, each building needs to be it’s own set, including coversheet, index, etc...
 - a. Original As-Built Set
 - b. Original Sealed Survey(s)
10. If not submitted with as-built set and applicable, please provide one official copy of each of the following drawings:
 - a. Fire Suppression
 - b. Building Automation
 - c. Clock Systems
 - d. Security Access Control

SECTION 01700 – CONTRACT CLOSEOUT

- e. Surveillance
 - f. Security and Fire Alarm Detections
 - g. Irrigation
 - h. Telecom
11. Two copies of Operations/Maintenance Manuals. If multiple buildings within a project; provide individual manual set(s) for each building.
One copy/set will be kept in Archives and one copy/set will be kept at the school.
- a. If electronic files are available, provide on CD (MS Word or searchable PDF format).

END OF SECTION 01700

SECTION 01710 – FINAL CLEANING

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Work specified in this section includes all labor, materials and equipment necessary for the final cleaning of the facility in preparation for occupancy by the Owner.

1.02 SEQUENCING/SCHEDULING

- A. Final cleaning shall occur prior to the Substantial Completion Inspection. The Contractor shall maintain cleaned areas in a spotless condition until final acceptance.
- B. If school schedule requires delivery of Owner's materials or furniture, Contractor shall obtain written acceptance of conditions and/or agreement regarding the Contractor's responsibilities for final cleaning.

PART 2 PRODUCTS

2.01 MATERIALS

- A. All materials used in final cleaning shall be manufactured for the specific purpose for which they are used or shall be recommended by the manufacturer of the product or material being cleaned.

PART 3 EXECUTION

3.01 ADJUSTING AND CLEANING

- A. Pre-Cleaning Inspection:
 - 1. Prior to final cleaning, Contractor shall inspect all finish work and repair or replace all damages due to scratched, cracked, broken, dented, stained, or otherwise unacceptable conditions prior to final cleaning.
 - 2. Contractor shall make all final adjustments for proper appearance and functionality.
- B. RESTORATION OF DAMAGED MATERIALS
 - 1. Remove and replace all items which cannot be completely cleaned. Replace all broken, scratched or cracked glass and plastics. Repairs must result in no noticeable difference in appearance or quality of the product.
- C. Final Cleaning
 - 1. At the completion of the work, the Contractor shall remove all spots, dust, grease, fingerprints and films from floors, walls, ceilings, windows, doors, glass, cabinetry, hardware, fixtures and equipment. Wipe clean all mechanical, electrical and elevator equipment.
 - 2. Clean all plumbing fixtures to sanitary conditions.
 - a) Remove all water stains from fixture surfaces.
 - b) Leave fixtures free of dust, dirt, scratches, etc.
 - 3. Vacuum carpets. Shampoo carpets if necessary to remove stains.
 - a) Carpets shall be free of dust, debris, pressure marks, ripples, etc.
 - 4. Markerboards shall be free of dust, marks, scratches or other marks.
 - 5. Walls shall be cleaned and left free of dust, paint runs, drips or spatters. There shall be no noticeable differences in sheen observed.
 - 6. Glass surfaces shall be left free of dust, scratches, streaks and smears.

SECTION 01710 – FINAL CLEANING

7. Clean surfaces in non-occupied areas.
 - a) Broom clean concrete floors.
 - b) Wipe down and remove spots from unpainted walls and ceilings.
8. Power scrub and buff all hard surface flooring.

END OF SECTION 01710

SECTION 01720 – PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.01 PROJECT RECORD DOCUMENTS

- A. The Contractor shall maintain at the job site one record copy of Contract Drawings, Specifications, Addenda, approved Shop Drawings, Change Orders, other modifications to the Contract, field test records and other approved documents submitted by the Contractor in compliance with specification requirements.
- B. These Documents shall be accurately marked with all changes made during construction. As-built notes shall be marked with pencil (or ink) of contrasting color.
- C. Project record documents shall be stored apart from documents used for construction. Do not use record documents for construction purposes. Maintain documents in clean, legible condition. Project record documents shall be available at all times for review of the Architect or Owner.

1.02 RECORDING

- A. Label each document "PROJECT RECORD COPY" in 2" high printed letters. Keep record documents current. Do not permanently conceal any work until required information has been recorded.
- B. Contract Drawings: legibly record the following:
 - 1. Field changes of dimension and detail made during construction process.
 - 2. Change made by Change Order or Field Order.
 - 3. Details not on original Contract Drawings.
 - 4. Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements.
 - 5. Location of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of structure.
 - 6. Depths of various elements of foundation in relation to first floor level.
 - 7. Location of all valves and cleanouts.
- C. Closeout Survey Information:
 - 1. Contractor shall obtain the services of a certified land surveyor to provide verified locations of all major buried utilities measured from property corners. Surveyor shall record depth of utility at definitive points such as building entry and connection to primary utility service to the site.
 - 2. Provide buried utility information in AutoCAD format prepared by the surveyor.
 - 3. Deliver Closeout Survey information with other closeout documents.

1.03 SHOP DRAWINGS:

- A. Maintain as record drawings:
 - 1. Legibly annotate shop drawings to record changes made after review.
 - 2. At completion of the project, the as-built noted set of documents shall be turned over to the Architect. The Architect will utilize this information along with other available data in preparing the "As-Built Record Drawings" for the project.
- B. Refer to Divisions 15 - Mechanical, and 16 - Electrical for supplemental requirements for Project Record Documents.

SECTION 01720 – PROJECT RECORD DOCUMENTS

1.04 SUBMITTALS

- A. Where projects include multiple sites, the Contractor shall separate all Record Document submittals by school.
- B. Upon completion of the Project, submit one (1) copy of Project Record Documents to the Architect for review.
- C. Upon approval of the submitted documents, the Contractor shall submit two (2) complete sets of project record documents: separate set per building if multiple buildings to the Architect for delivery to the DPS Project Manager.
 - 1. See section 01340 – Submittals and Shop Drawings
- D. The Architect shall complete the As-Built Drawing sets and shall deliver drawings and other record documents to the DPS Project Manager. (see Sections 00001, 01730 & 01740).

END OF SECTION 01720

PART 1.00 - GENERAL

1.01 PROCESS AND SEQUENCE

- A. At the completion of the project, the Contractor shall submit to the Architect informational literature on the proper operation, maintenance, manufacturer's adjustment and repair of all equipment installed under this Contract which may require routine adjustment and/or maintenance.
- B. Literature for each equipment item shall be identified with product manufacturer, item name, item number, serial number, general location, electrical circuit number (if applicable), and name, address, and telephone number of the nearest manufacturer's representative for product service.
- C. ROOFING MAINTENANCE INSURANCE AND REPAIR INSTRUCTIONS.
 - 1. At the completion of the project, submit copies of manufacturer's standard literature describing the care, maintenance, and repair of the installed roofing system.
 - 2. Include guidelines to assure validity of warranty coverage.
 - 3. Include names, addresses, and telephone numbers of the Contractor, Manufacturer, Regional Distributor, and Manufacturer "hotline".
- D. Refer to Division 15 - Mechanical and Division 16 - Electrical for supplemental requirements for Operation and Maintenance Data.

1.02 SUBMITTALS

- A. Where projects include work at multiple sites/buildings, O&M Manuals shall be produced for each site/building including only those documents that relate to the specific site.
- B. Provide two (2) complete sets of printed operations and maintenance instructions for all identified components of the work.
- C. Instruction manuals shall be delivered to the Architect at one time for review and approval.
- D. Format:
 - 1. Operation and Maintenance Data shall be 8 1/2 x 11 inches or proportional increment.
 - 2. AutoCAD format submittals (AutoCAD current compatible version per DPS Facility Archives Staff - *.DWG format) *See section 01720 – Project Records Documents
 - (a.) Irrigation plans
 - (b.) Fire Alarm shop drawings corrected to reflect actual installation.
 - (c.) Mechanical Control Drawings
 - (d.) Fire Sprinkler Shop Drawings.
 - 3. All files shall be submitted in PDF format in addition to all CAD files.
 - 4. Materials shall be bound at the full length of the left edge.
 - 5. Include covers and backs with identification data.
 - (a.) School name shall be official name of school if other than original working title.
 - 6. Electronic copies of O&M Manuals shall be accepted on a CD to assist the required hard copies (MS Word or Searchable .PDF or HTML Format).
 - 7. One bound hard copy and electronic copy of specifications:
 - (a.) If multiple buildings are included in the project. Submit one copy for each facility.
 - (b.) Submit As-Built MS Word and or searchable .PDF electronic file:

SECTION 01730 – OPERATING AND MAINTENANCE DATA

(1.) Use highlight or strikeout to identify which manufacturer or products were used in the construction.

E. Refer to individual specification sections for additional requirements.

END OF SECTION 01730

SECTION 01740 – WARRANTIES AND BONDS

PART 1 GENERAL

1.01 GENERAL CONTRACTOR TWENTY-FOUR MONTH GUARANTEE OF MATERIALS AND WORKMANSHIP

- A. The Contractor shall guarantee in writing to the Owner that all work performed and all materials and equipment furnished under this contract are new and in accordance with the Contract Documents, are free from defects in equipment, materials or design furnished, or workmanship performed by the Contractor or any of his subcontractors or suppliers at any tier. Such guarantee shall continue for a period of twenty-four (24) months from the date of Substantial Completion of the work.
- B. Under this guarantee, the Contractor shall agree to remedy at his own expense any inferior or defective equipment, materials, workmanship, or design that should develop during the guarantee period, or in restoring any other work damaged in fulfilling the terms of the guarantee.
- C. The Contractor shall not perform any work that shall void any Manufacturer Guarantee and Warranty.

1.02 MANUFACTURER GUARANTEE AND WARRANTY

- A. As identified in other Sections of these Specifications, the Contractor shall provide written manufacturer's guarantees and/or warranties for specific materials, products, and equipment furnished under this contract.
- B. Such guarantees and warranties shall be valid for the period of time stated in each applicable specification from the date of Substantial Completion of the work but not less than twenty-four (24) months.

1.03 EXTENDED WARRANTIES

- A. As identified in other Sections of these Specifications, the Contractor shall provide written manufacturer's guarantees and/or warranties for specific materials, products, and equipment furnished and installed under this Contract.
- B. Such guarantees/warranties shall be valid for the stated extended period beyond twenty-four (24) months from the date of Substantial Completion of the work.

1.04 EXCLUSIONS

- A. Warranty requirements contained in these Specifications take precedence. Exclusion clauses shall be superseded by warranty coverage requirements of the Specifications.
- B. The Contractor shall notify the Architect of design conditions which cannot be fully warranted. Such notice shall be in writing prior to purchase of the affected product or system.
- C. Failure to provide such notice shall not be grounds for waiver of warranty requirements contained in the Specifications.
- D. Upon receipt of such notice, the Architect will consider modifications necessary to assure that final construction is warrantable to the full extent of Contract requirements.

SECTION 01740 – WARRANTIES AND BONDS

1.05 SUBMITTALS

- A. Guarantee and Warranty certificates shall be bound into the Operation and Maintenance Manuals as indicated in Section 01730.
- B. GENERAL CONTRACTOR GUARANTEE
 - 1. Submit original executed copies to the Architect with Project Closeout materials.
- C. MANUFACTURER GUARANTEE/WARRANTY
 - 1. Submit sample copies to the Architect prior to ordering warranted products.
 - 2. Submit original executed copies to the Architect with Project Closeout materials.
- D. EXTENDED WARRANTIES
 - 1. Submit sample copies to the Architect prior to ordering warranted products.
 - 2. Submit original executed copies to the Architect with Project Closeout materials.

END OF SECTION 01740

SECTION 02220 – EXCAVATING, BACKFILLING & COMPACTION

PART 1 GENERAL

1.01 WARRANTY

- A. Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.
- B. The term of warranty will be 24 months.

1.02 EXISTING UTILITIES

- A. Contractor shall be responsible for locating all existing utilities (including depth), both public and private, that may conflict with the proposed construction.
 - 1. Contractor shall physically verify location of all buried utilities within 20' of proposed excavations.
 - 2. Physical location of utilities shall be accomplished by hand excavation and potholing until the utility is encountered.
 - 3. If utility is reported to be within 20' of the excavation and is not found by potholing, the Contractor shall contact the Owner and A/E for instructions.
 - 4. Utilities with uncertain location shall be brought to the attention of the A/E and the Owner.
 - 5. Contractor shall stop excavation upon encountering unexpected subsurface utilities during excavation or trenching, and the A/E shall be notified immediately. Work shall not resume until the A/E has issued a directive.

PART 2 PRODUCTS

2.01 MATERIALS

- A. General backfill quality
 - 1. Specify acceptable and unacceptable soil classifications for each type of soil backfill material.
 - 2. Specify pipe bedding materials, both inside and outside the building.
 - 3. Pipe bedding materials should include crushed aggregate that has bridging qualities which will reduce "ovalling" and low spots in gravity flow systems.
 - 4. Free of brush, sod, organic material, vegetable matter, debris and other deleterious substances
 - 5. Shall not contain rocks or lumps having a diameter of more than 2 inches
 - 6. Free of frozen material
 - 7. The use of on site soils (provided they are acceptable) should be prioritized above other options
- B. Structural fill
- C. Non-structural fill
 - 1. Non-structural fill material includes all fill not supporting structures or site paving and approved by the Owner's Testing Agency.
 - 2. Granular, non-expansive material suitable for specified compaction, as approved by the Geotechnical Engineer
- D. Geo-grid materials as specified by the geotechnical or civil engineers
 - 1. Alternate geo-textile or geo-grid materials not conforming to Geotechnical Engineers recommendations, require written approval from Owner's Testing Agency prior to use.
- E. Flow fill
 - 1. Where excavations are required inside of a building or other structure and within 2 feet of the exterior wall or footings, the Contractor shall use flowable concrete fill having a 28-day compressive strength of not less than 60 psi.

PART 3 EXECUTION

3.01 PREPARATION

- A. Stockpile topsoil.
- B. Stockpile other materials, in an approved location and manner, as indicated to be salvaged and reused (such as squeegee).
- C. Remove debris and organic matter and dispose of legally off-site.

SECTION 02220 – EXCAVATING, BACKFILLING & COMPACTION

3.02 CONSTRUCTION

- A. Excavation
 - 1. Contractor shall be responsible for safety of excavations and for protection of existing buried utilities.
 - 2. Unauthorized excavation and remedial work shall be at the Contractor's expense.
- B. Backfill
 - 1. Owner's Testing Agency must inspect and approve sub-grade prior to backfilling.
 - 2. Backfill only after the A/E's acceptance of below grade construction.
- C. Compaction
 - 1. Compaction under landscaped or lawn areas shall be not less than 80% nor greater than 90% Standard Proctor within the top 18 inches of soil.
 - 2. Specify proof rolling for paving areas and slab pads and require that the Owner's Testing Agency witness the proof rolling.
- D. Dewatering
 - 1. Dewatering of excavations is the responsibility of the contractor.

3.03 PROTECTION

- A. Sediment and erosion control: In no case shall construction activities commence without approved temporary erosion and sediment control measures in place.
- B. Property and environment: Contractor shall protect existing structures, appurtenances, trees and shrubs and their associated root systems. A warranty of 24 months shall be enforced to cover all excavation, backfill, and compaction sitework.
- C. For more information on erosion control please refer to Denver Water (<http://www.denverwater.org/>), the EPA (<http://www.epa.gov/ebtpages/watwaterpollution.html>), or the Colorado Department of Health and the Environment (<http://www.cdphe.state.co.us/regulations/wqccregs/>)

3.04 FIELD QUALITY CONTROL

- A. Notifications:
 - 1. The Contractor shall notify the A/E and the DPS Project Manager at least 10 working days prior to each phase of excavation, backfill, and compaction.
 - 2. Contractor shall work with the Owner to schedule Owner's inspections and testing.
- B. Information provided by Owner's consultants is not represented as sufficient to guarantee compliance with Contractor contract requirements. Contractor is responsible for his own testing to assure compliance with Contract Documents, at his own expense.
 - 1. Contractor shall submit qualifications of the testing consultant, if different than Owner's Testing Agency, used for testing purposes on his own behalf.
 - 2. All additional information resulting from contractor testing shall be shared with the Owner and A/E.
- C. The Owner will retain the services of an Owner's Testing Agency for observation, testing, and quality control of work in this Section.
 - 1. Frequency of testing (including sub-grade under curb and gutter, trenches, footings, slabs-on-grade and other bearing surfaces), testing methods (include one sand cone for every ten nuclear tests for correlation), and by which method shall be developed in conjunction with the Owner's Testing Agency and approved by the DPS Project Manager prior to inclusion into this specification section.
 - 2. The Contractor shall supply location and elevation reference points for the use of the Testing Agency to locate the test points.
 - 3. The Contractor shall track test locations to verify that each lift has been compacted and tested in accordance with these specifications.
 - 4. Preliminary test reports from subsurface investigations will be provided to the Contractor from the Owner's Testing Agency.
- D. Contractor will be provided test and report information provided by the Owner's Geotechnical Engineer and Testing Agency.
- E. If additional testing/observation is needed, contractor shall obtain and pay for such services at his own expense.

SECTION 02220 – EXCAVATING, BACKFILLING & COMPACTION

3.05 VEGITATED SWALES

- A. Vegitated swales are drainage systems defined by broad, shallow channels with dense stands of vegetation.
- B. Vegitated swales should be considered as a tool for managing water runoff and shall be considered as an option on school grounds.
- C. Construction Guidelines:
 - 1. Parabolic or trapazoidal cross-sections are recomended
 - 2. Swale slopes should be in the range of .5-3%. Lower slopes contribute to greater water infiltration and removal of pollutants, but must be taken to ensure there is not standing water in the swale
 - 3. The prefered length and width of a swale is depent upon the area being drained, and the frequency and intensity of storm events.
 - 4. Compacted, and/or exposed soils are the most common causes of ineffective swales, and these conditions shall be avoided.
 - 5. Close-growing, water-resistant grasses are among the preferd vegetations for a swale. Consideration should also be given to hardiness, maintance, and aesthetics.
 - 6. For more information please refer to the EPA Storm Water Fact Sheet (<http://www.epa.gov/owm/mtb/vegswale.pdf>)
 - 7. Apply use of check dams as necessary per Civil Engineers recommendations.
 - a) For grades over 4 percent dams are to be placed every 50 feet
 - b) Dams are to be non earthen to withstand erosion.

END OF SECTION 02220

SECTION 02511 – CONCRETE

PART 1 GENERAL No standards

PART 2 PRODUCTS

2.01 ACCEPTABLE CONCRETE PRODUCTS

- A. Lithocrete®
- B. Bomanite®
- C. Grasscrete
- D. Other with owner approval

PART 3 EXECUTION

3.01 GENERAL

- A. Also reference Section 03300.
- B. The start of paving work implies acceptance of sub-grade with test results for verification. Refer to Section 02220.
- C. Curing and sealing compound
 - 1. Apply curing and sealing compound uniformly to new exterior flatwork, concrete slabs and walks, where the concrete is designated to be exposed to view and wear in the finished construction.
 - 2. Sandblasted flatwork requires an epoxy resin applied to prevent silting.
 - 3. Refer to Section 03345 for additional standards.
- D. Tolerances
 - 1. Minimum 1.5% slope on all concrete surfaces to drain.
 - 2. Sloped concrete surfaces shall not pond water (regardless of other tolerances specified).
- E. Protection: The Contractor shall be responsible for protecting newly-placed concrete from damage due to traffic and vandalism.

3.02 FIELD QUALITY CONTROL

- A. Please refer to sections 02000 and 02220, Site Works and Excavation for information regarding testing and quality control

END OF SECTION 02511

PART 1 GENERAL No standards

PART 2 PRODUCTS

2.01 MATERIALS

- A. General: Use locally available materials and gradations that exhibit a satisfactory record of previous installations, and that meet CDOT requirements.
- B. Aggregates: Clean, hard, durable particles of crushed stone, crushed slab, crushed gravel, or natural gravel
 - 1. Construction Waste Management: Divert the entire quantity of removed asphalt to be recycled
 - 2. Recycled Content: a minimum of 20% (1/2 post consumer + 1/2 pre-consumer) is to be used. Percentages of recycled content to conform with CDOT specifications.
 - 3. Asphalt materials to be extracted processed and manufactured regionally.
- C. Mixes
 - 1. Plant-mix pavements: Specify job-mix formulas for each asphalt pavement type.
 - 2. Asphaltic concrete base or surface course: Mix aggregates and bituminous materials
 - a) Base course: Grade S Hot Bituminous Pavement using Superpave Performance Grade 58-28 Binder.
 - b) Surface (wearing) course: Grade SX Hot Bituminous Pavement using Superpave Performance Grade 58-28 Binder.
 - 3. Overlay asphalt mix: Same as wearing course materials
 - 4. Pavement patching: Grade SG Hot Bituminous Pavement using Superpave Performance Grade 58-28 Binder.
- D. Specify geotextile pavement reinforcement fabric under asphalt overlay.
 - a) "Petro Mat" as produced by Phillips Fibers, Greenville, SC
 - b) Trivera Spunbond 1114 as produced by Hoechst Celanese Corp., Spartanburg, SC
 - c) Mirafi Mirapave 500 as produces by Ten Cate Nicolon, Pendergrass, GA
- E. Tack coat: AC10 Asphaltic Cement or emulsion
- F. Soil sterilant
 - 1. Material shall be of an organic nature with minimum leaching characteristics.
 - 2. Preferred product is Simazine of the Triazine group.
- G. Reclaimed asphalt pavement (RAP) should be encouraged. If it is, it needs to have the following requirements:
 - 1. 100% of material must pas through a 50mm sieve
 - 2. Can be used in the base, binder and/or surface courses
 - 3. The recycled materials must have the same properties as virigin material.

PART 3 EXECUTION

3.01 PREPARATION

- A. For pavements to be resurfaced:
 - 1. Specify appropriate patching and crack filling operations and apply tack coat.
 - 2. Install pavement reinforcement fabric.

SECTION 02513 – ASPHALT PAVING

3. Apply additional tack coat where needed. Apply sand to areas where excessive tack coat appears on surface.
 4. When overlaying the finished surface needs to be considered for rise of steps that the asphalt is up against
 5. When overlaying site furnishings need to be reset to have proper finished install height. (Tetherball sleeves, basketball goals, benches, tables, trash receptacles, etc)
- B. Proof rolling
1. Proof rolling of the sub-grade is required prior to placement of pavement and after sub-grade reconditioning has been completed.
 2. The A/E or the Owner's Testing Agency shall be present during proof rolling.
 3. The sub-grade shall be approved in writing prior to placement of pavement.
- C. Acceptable methods of subgrade stabilization
1. Incorporation of lime, if soil plasticity is greater than 10
 2. Cement or fly ash if soil plasticity is less than 10; this is the preferred method as it is not affected by subsequent rain
 3. Asphalt emulsion, where soil is very sandy
 4. Geotextiles

3.02 CONSTRUCTION

- A. Tolerances
1. Minimum slope of 2% to 3%
 2. The Owner reserves the right to require the Contractor to remove paved areas where the pavements thickness exceeds the maximum tolerance limits, creating birdbaths.

3.03 FIELD QUALITY CONTROL

- A. Notifications: Contractor shall work with the Owner to schedule Owner's Testing Agency inspections and testing.
- B. General: Testing in-place hot-mixed asphalt courses for compliance with requirements for thickness and surface smoothness will be done by Owner's independent testing laboratory. Repair or remove and replace unacceptable paving as directed by Owner or Engineer.
- C. Testing
1. The Owner will retain and pay for the services of an Owner's Testing Agency to perform tests and submit results to the A/E and Contractor.
 2. The Testing Agency will notify Contractor at the time of testing, prior to final report, if results do not meet specifications, so that corrective measures may be made immediately.
 3. Contractor shall repair cores taken at time of testing.
 4. A/E shall specify minimum acceptable results.
 5. A/E shall specify type of geotechnical testing.
- D. Water test by Contractor: New pavement shall be tested by flooding with water, at Contractors expense, to verify no adverse slopes or excessive birdbaths exist across pavement. Specified tolerances shall be met prior to acceptance by Owner.
- E. Additional tests or re-tests required for quality control shall be at Contractor's expense.
- F. Asphalt which fails to meet specified requirements shall be removed and replaced at the Contractor's expense. Testing of replacement asphalt shall be at the Contractor's expense.

3.04 CLEANING AND PROTECTION

A. Protection

1. Protect newly placed material from traffic by barricades or other suitable method until mixture has cooled and attained maximum degree of hardness.
2. After final rolling, do not permit vehicular traffic on asphalt concrete pavement until it has cooled and hardened, and in no case sooner than six hours.
3. Traffic is not permitted on in-place pavement reinforcement geotextiles unless approved by the DPS Project Manager and the A/E.

3.05 Striping

A. Paint: All exterior surface paint must be PPG Traffic Paint or approved equal by DPS Project Manager.

1. Solid areas of paint are not to exceed 12' in any direction; maps are not to be filled in in their entirety.

B. Maps

1. As educational elements, all maps should strive for complete geographic accuracy. Alaska and Hawaii should be striped in their correct locations and should be proportional in size.
2. Maps should be accurate in their orientation. Every effort should be made to have north on the striped map point north on the site.
3. Parking lot and dock areas to use yellow or white paint only.
4. Standard allowable colors are as follows: Dark Red, Light Red, Dark Green, Light Green, Dark Blue, Light Blue, Yellow, White, Dark Purple, Light Purple, Dark Orange, and Light Orange.
5. Chalk and have paint layout and location approved by owners rep prior to painting
6. On 23rd month of the 24 month warranty the painted elements are to be repainted

END OF SECTION 02513

PART 1 GENERAL No standards

PART 2 PRODUCTS

2.01 MATERIALS

- A. Steel and malleable iron: Galvanized
- B. Aluminum: Prohibited
- D. Fabric
 - 1. 2" mesh
 - 2. General fencing shall be nine (9) gauge, chemically cleaned, galvanized.
 - 3. Backstop fabric shall be six (6) gauge, chemically cleaned, galvanized.
 - 4. Knuckled top and bottom
 - 5. No sharp metal or galvanizing burrs are allowed.
- E. Posts
 - 1. End, corner and pull posts
 - a) Schedule 40, 2.875" O.D. minimum for up to 8'-0" height
 - b) Schedule 40, 3.5" O.D. minimum for posts to 10' height
 - 2. Line posts: Schedule 40, 2.375" O.D. minimum
 - 3. Gate Posts
 - a) Single gates: Schedule 40, 2.875" O.D. minimum
 - b) Double gates: Schedule 40, 3.5" O.D. minimum
 - 4. Post caps
 - a) Line posts: Weather tight closure caps with opening for top rails
 - b) Terminal posts: Weather tight closure caps
 - 5. Provide escutcheon or slope grout to provide positive drainage away from pipe.
- F. Rails
 - 1. Minimum 1.66" O.D., Schedule 40
 - 2. Expansion sleeves are prohibited unless approved by DPS Project Manager.
 - 3. Provide bottom rail at backstops and on backstop wings.
 - 4. Intermediate rails are required for fences over 4'-0" in height.
- G. Gates
 - 1. Perimeter frame: 1.90" O.D. minimum, Schedule 40
 - 2. Weld corners of frames and touch-up weld spots with black coating.
 - 3. Hardware
 - a) Commercial grade
 - b) Hinges (Weld all latches)
 - i) Non-lift off
 - ii) 180 degree swing
 - iii) One pair (minimum) up to and including 6'-0" height
 - iv) One and one-half pair (minimum) on gates over six feet 6'-0" height

SECTION 02830 – CHAIN LINK FENCING

- v) Weld in place. Bolt or screw attachment of hinges is prohibited.
- c) Latches (Weld all latches)
 - i) Padlock eye
 - ii) Operation either side
 - iii) Single gate: Fork type
 - iv) Double gate: Cane bolt/drop pin assembly mounted to gate, vertical frame, designed to engage strike/ground sleeve that is embedded 18" minimum in concrete (inactive leaf)
 - Pipe would be preferred in lieu of rods for can bolts
- d) Rolling gates
 - i) Allowed at service entries only
 - ii) Minimum two 1-1/2" tracks
 - iii) Two pressed steel track rollers
 - iv) One double-wheel ground roller minimum
- e) Cantilever gates
 - i) Solid track wheels, cast iron
 - ii) 2 3/8" Minimum O.D. Rail / Frame, Schedule 40
 - iii) 4" minimum support posts
 - iv) If gate is in a play area, provide a protective shield over the rollers.
- H. Backstops shall be fabricated with welded joints. Welded joints will be toughed up per manufacturer's recommendations.
- I. Accessories
 - 1. Truss rods: 3/8" diameter with turnbuckle and post anchors
 - 2. Tension bar: Full height, 1/4" x 3/4" (minimum)
 - 3. Tension clamps: 14 gauge x 1" (minimum)
 - 4. Tension wire: 9 gauge (minimum)
 - 5. Tie wires: 12 gauge (minimum)
- J. Concrete
 - 1. Portland cement, ASTM C150; aggregates, ASTM C33; and clean water
 - 2. Mix materials to obtain concrete with a minimum 28-day compressive strength of 3000 psi.
 - 3. Mix shall use at least five (5) sacks of cement per cubic yard and 1" maximum size aggregate.
 - 4. Mix shall have a maximum slump of three (3") and between 2% and 4% entrained air.
- K. Wind screen
 - 1. Windscreen shall have reinforcing tape hog ringed to chain link
 - 2. Every grommet has a hog ring (9g minimum) Zip Ties Prohibited
 - 3. Douglas Polypro+ or equivalent
 - 4. Double stitched sewn reinforcement Air vents with locations specified

PART 3 EXECUTION

3.01 INSTALLATION

A. Post spacing

1. General: 10' on center (maximum)
2. At rolling gates: 5' on center (maximum)

B. Post foundations

1. Concrete shall be used for post foundations. The depths listed below are minimum embedment depth of the fence post in concrete for fences without wind screens. The foundation depth shall provide an additional 6" of concrete below the embedment depth.
 - a) 4' & 6' Fence Heights: Minimum 12" diameter by 3'-0" deep
 - b) 12' Fence Heights: Minimum 18" diameter by 3'-0" deep
 - c) 18' Fence Heights: Minimum 24" diameter by 4' deep
 - d) 24' Fence Heights: Minimum 24" diameter by 6' deep

C. Fencing heights

Overall, fencing should be kept to the minimum amount necessary *to meet the objectives outlined in the Intent section above*. Fencing should be located within or on the school property boundary. All fencing and backstops should include a flush concrete mow strip. The following are the minimum required fencing locations and heights are outlined below. Heights may be increased exists where deemed appropriate and approved by the district.

1. Elementary Schools

- a) Parking lots: Review with DPS Project Manager
- b) Playground to surrounding street: 6'-0"
- c) ECE/Kindergarten play area: 4'-0"
- d) Play apparatus areas (swings, etc.): ECE= 4'-0", Primary= 6'-0"
- e) Backstops: 12'-0" with 4'-0" hood

2. Middle Schools and High Schools

- a) Parking lots: Review with DPS Project Manager
- b) Tennis courts: 12'-0" with court wings extending 10'-0" into court from entrance
- c) Basketball courts: 12'-0"
- d) Backstops
 - i) Softball: 18'-0" with 4'-0" hood
 - ii) Baseball: 24'-0" with 5'-0" hood

D. Gates and other access locations

1. Clear opening < 5'-0", single gate
2. Clear opening < 10'-0" and > 5'-0", double gate
3. Clear opening 2/3-1/3 gate- vehicle/ pedestrian combo gate
4. The type of gate or vehicle barrier structure for any access opening in excess of 10' shall be coordinated with the DPS Project Manager. Avoid larger openings wherever possible. Preliminary gate types are as follows:

SECTION 02830 – CHAIN LINK FENCING

- a) Clear opening < 20'-0" and > 10'-0", rolling gate
- b) Clear opening > 20'-0", cantilever gate
- E. Truss rods: Provide at all terminations and changes in direction, from top of nearest line post to bottom of terminal or corner post.
- F. Tension bar clamps: 15" on center (maximum)
- G. Tension wires
 - 1. All fencing fabric: Continuous length (no splices permitted), woven through fabric at 2nd diamond, 4" from bottom
 - 2. Fencing over 4'-0" in height: Additional tension wire, continuous length, woven through fabric at 2'-0" above bottom of fabric
 - 3. Backstops: Continuous length, woven through fabric at bottom, 18" and 36" above bottom
 - 4. Continuous welded pipe rail may be used in lieu of tension wire.
- H. Tie wires
 - 1. Line posts: 12" on center (maximum)
 - 2. Rails: 24" on center (maximum)
- I. Remove sharp edges and protrusions.

3.02 WIND SCREEN INSTALLATION

- A. Fasteners: Galvanized steel hog rings, minimum 9 gauge
- B. Every grommet shall have a fastener.
- C. Reinforcing tape
- D. Sewn reinforcement air vents
- E. Zip ties prohibited

END OF SECTION 02830

SECTION 03100 – CONCRETE FORMWORK

PART 1 GENERAL No standards

PART 2 PRODUCTS

2.01 FORM TIES

- A. Formwork Panels: Specify material appropriate for finish desired.
- B. Form release treatment
 - 1. Coordinate form release oils or other products with materials to be applied over concrete (i.e. dampproofing, waterproofing and finish materials).
 - 2. Form oil is prohibited where stucco, plaster or paint is to be applied to formed concrete surfaces.
- C. Form ties shall be plastic cone type – break-away only.
 - 1. Exception: For high lift pours where concrete pressure will exceed the capabilities of the plastic cone ties, design a form tie system that will withstand pressures and that can be patched in a manner suitable to receive applied damp-proofing and waterproofing.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Specify period of curing time required before shoring removal and form removal is allowed.

3.02 FIELD QUALITY CONTROL

- A. Notification: Contractor shall work with the Owner to schedule Owner's inspections and testing.
- B. Owner will provide formwork inspection for Owner's information at Owner's expense.
- C. Contractor will be provided with Owner's inspection information and may use information as a part of Contractor's quality control. However, Owner does not represent that the frequency or type of inspection is adequate to assure compliance with contract requirements. Contractor shall provide additional testing and inspections needed to assure contract compliance, at Contractor's expense.
- D. Additional inspections or re-inspections required for quality control shall be at Contractor's expense.

END OF SECTION 03100

SECTION 03300 – CAST-IN-PLACE CONCRETE

PART 1 GENERAL No standards

PART 2 PRODUCTS

2.01 CONCRETE MIXING

- A. Addition of water is prohibited unless authorized by the A/E.

2.02 CONCRETE MIX (GENERAL CONCRETE)

- A. Cement type
- B. Strength: Minimum 3,500 psi compressive strength at 28 days
- C. Mix: 5-1/2 sack/cy minimum
- D. Flyash
 - 1. Flyash is discouraged. 100% cement mix is preferred.
 - 2. At Structural Engineer's discretion, flyash may be used provided that the flyash content shall not exceed 20% of the total weight of cementitious material.
- E. Water: Potable
- F. Air entraining admixture
 - 1. 4% - 7% for structural concrete
 - 2. Not required for slabs on grade
- G. Slump: 4" (maximum)

2.03 CONCRETE MIX (EXTERIOR FLATWORK, WALKS AND PAVING)

- A. Cement type
- B. Concrete strength: 4,000 psi minimum compressive strength at 28 days
- C. Mix: 6 sack/cy minimum
- D. Flyash: Flyash content of cast-in-place concrete shall not exceed 20% of the weight of cementitious material.
- E. Water: Potable. Water/cement ratio shall not exceed 0.42 (water to total weight of cementitious materials).
- F. Air entraining admixture: 5% - 8%
- G. Water reducing admixture: Specify brand or generic description and ounces per unit of cement.
- H. Slump
- I. City mix: Specify mix approved by City and County of Denver for work in public right-of-way.

2.04 AGGREGATE

- A. Specify maximum sizes of aggregates.
- B. Recycled concrete aggregate shall not be used on floor slabs which will receive finish floor coverings.
- C. Concrete aggregate shall have ph level of less than 11.

2.05 PROHIBITIONS

- A. Calcium chloride
- B. Accelerators: High range water-reducing agents or additional cement may be added only at discretion of Structural Engineer.

SECTION 03300 – CAST-IN-PLACE CONCRETE

- C. Other chemical antifreeze or accelerant agents
- D. Liquid nitrogen
- E. Ice or other frozen materials
- F. Waterproofing admixtures, silane, siloxane

PART 3 EXECUTION

3.01 INSTALLATION

- A. Concrete placement
 - 1. No concrete shall be placed which has reached a temperature of 90 degrees F.
 - 1. Specify restrictions for cold and hot weather placement.
- B. Tolerances
 - 1. Specify tolerances.
 - 2. List any special or unusual tolerance requirements separately.
- C. Protection and curing
 - 1. Specify concrete protection during curing as well as materials to be used. Specify the curing period and curing record requirements.
 - 2. Interior flat slab curing shall be by application of moisture through use of water mist and/or covering of slab surfaces with fabric or other moisture retaining materials. Maintain moisture content of coverings by regular application of water as required.

3.02 FIELD QUALITY CONTROL

- A. Notifications: Contractor shall work with the Owner to schedule Owner's inspections and testing.
- B. An independent testing laboratory will be employed by the Owner to perform tests and submit results to the A/E and Contractor.
 - 1. Slump: Per ASTM C-143, one test at point of discharge for each load
 - 2. Compressive strength: Per ASTM C 39, one set of six cylinders per test. Two tests at seven days, two at 28 days, two in reserve.
 - 3. Air Entrainment: One test for each set of cylinders
 - 4. Concrete temperature for each slump test
 - 5. Frequency of testing (six cylinders per set)
 - a) One set of cylinders for first 25 cubic yard poured each day
 - b) One set of cylinders for each additional 50 cubic yards
 - c) Minimum of one set cylinders for each structural placement regardless of quantity
- C. Contractor's testing
 - 1. The Contractor shall perform, at his own expense, such quality control testing as may be needed to assure that the construction is in compliance with the Contract Documents. Testing by Owner's agents shall not be relied upon by the Contractor as sufficient to assure Contract Document compliance. Contractor's test results shall be forwarded to the A/E and Owner for their records.
- D. Additional tests or re-tests required for quality control shall be at Contractor's expense.

SECTION 03300 – CAST-IN-PLACE CONCRETE

- E. Concrete which fails to meet specified requirements shall be removed and replaced at the Contractor's expense. Testing of replacement concrete shall be at the Contractor's expense.

END OF SECTION 03300

SECTION 03600- GROUT

PART 1 GENERAL

1.01 TESTING

- A. Contractor shall perform quality control testing for structural grout to assure minimum load carrying capacities are met. Such testing shall be at the Contractor's expense. Upon request, test results shall be distributed to Architect and Owner.
- B. Owner may request testing by Owner's Testing Agent if Owner so desires. Contractor shall fully cooperate in providing access and samples for Testing Agent.

PART 2 PRODUCTS No standards

PART 3 EXECUTION No standards

END OF SECTION 03600

SECTION 04110 – MORTAR AND MASONRY GROUT

PART 1 GENERAL

- A. The methods and recommendations of the National Concrete Masonry Association (NCMA), Brick Institute of America (BIA), and Rocky Mountain Masonry Institute (RMMI) shall be followed.

PART 2 PRODUCTS

2.01 MATERIALS

- A. General
 - 1. Admixtures such as air-entraining and antifreeze compounds are strictly prohibited.
 - 2. Calcium chloride is prohibited.
- B. Mortar
 - 1. Portland cement
 - 2. Hydrated lime
 - 3. Pigmented mortar is prohibited without prior approval of the DPS Project Manager.
- C. Mortar accessories
 - 1. Mortar control (such as Mortar Net or equivalent)
 - 2. Weeps: Louvered or plastic cellular venting type at head joints
 - a) Tube weeps, open head joints, wicks, and nylon weeps are prohibited.
- D. Grout
 - 1. Specify grout strength per ASTM 28-day strength.
 - 2. Specify grout mix design appropriate for high- or low-lift grouting, as designed by the Structural Engineer.
 - 3. Grout aggregate shall not exceed $\frac{3}{8}$ " in diameter.
- E. Inserts and anchors: Stainless steel
 - 1. Plastic inserts and anchors are prohibited.
- F. Ventilators: 10'-0" maximum vertical interval (or centerline of wall 11 feet to 20 feet tall)

2.02 MORTAR MIXES

- A. Pre-mixed mortar, factory blended to design specification and delivered to jobsite in packages labeled with mortar design, is preferred over job-mixed mortar.

PART 3 EXECUTION

3.01 MORTAR MIXING

- A. For job-mixed mortar, measurements for site batching of mortar shall be taken with calibrated measuring instruments. "Shovel" portions will not be accepted.
- B. Blend mortar in a mechanical mixer.
- C. Retempering is not permitted.

3.02 MORTAR AND GROUT INSTALLATION

- A. Mortar control is mandatory for cavity wall construction.
- B. See other Division 4 standards for mortar and grout installation.

SECTION 04110 – MORTAR AND MASONRY GROUT

3.03 FIELD QUALITY CONTROL

- A. Contractor shall work with the Owner to schedule Owner's masonry inspections and testing.
- B. Mortar: Contractor shall perform mortar testing necessary to assure compliance with the Contract Documents. Such testing shall be at the Contractor's expense. Test results shall be distributed to Architect and Owner.
- C. Grout: Owner will provide for testing and inspection of masonry grout and grouting for Owner's information at Owner's expense.
 - 1. Quality control testing for low-lift grouting will be performed during construction for each 25 cubic feet of grout or 2,500 square feet of wall area, which ever comes first.
 - 2. Quality control testing for high-lift grouting will be performed during construction for each grout pour.
 - 3. Contractor will be provided with Owner's testing information and may use test information as a part of Contractor's quality control. However, Owner does not represent that the frequency or type of testing is adequate to assure compliance with contract requirements. Contractor shall provide additional testing needed to assure contract compliance, at Contractor's expense.
 - 4. Additional tests or re-tests required for quality control shall be at Contractor's expense.

END OF SECTION 04110

SECTION 04200 – UNIT MASONRY

PART 1 GENERAL

- A. The methods and recommendations of the National Concrete Masonry Association (NCMA), Brick Institute of America (BIA), and Rocky Mountain Masonry Institute (RMMI) shall be followed.

PART 2 PRODUCTS

2.01 BRICK MATERIALS

- A. Face brick
 - 1. Grade SW, type FBS (ASTM C-216-87)
 - 2. Specify minimum of two brick manufacturers.
- B. Concrete masonry units
 - 1. Hollow load-bearing concrete block, Grade N
 - 2. Specify minimum of two concrete masonry unit manufacturers.
 - 3. Ends: Concave; bullnose at interior exposed corners
 - 4. Special shapes
 - a) Provide special manufactured shapes of concrete masonry units including solid units, lintel blocks, bond beams, facing units, etc.
 - b) Sound absorbing acoustic units: NRC 65 minimum rating
- C. Ties
 - 1. Two-piece slotted or clip-and-loop only
 - 2. Single-piece flat stock, corrugated, wire ties, and ferrous materials prohibited
- D. Horizontal joint reinforcement: Truss type
- E. Accessories
 - 1. Embedded flashings
 - 2. Control joint materials
 - 3. Expansion joint materials
 - 4. Other masonry accessories per standard Section 04110

PART 3 EXECUTION

3.01 INSTALLATION

- A. Mortar joints
 - 1. Lay units with full mortar beds on bed faces and minimum 85% coverage on head joints.
 - 2. For units requiring grouting, apply mortar to webs also.
 - 3. Exposed-to-view mortar joints shall be rodded to a smooth, concave finish.
 - 4. Mortar joints not exposed to view in the finished construction shall be cut flush with masonry.
 - 5. Strike joints flush at surfaces scheduled to receive plaster.
- B. Rake back top of wall at end of workday. Tothing of subsequent masonry is not acceptable.
- C. Protect top of masonry walls and veneers to prevent water infiltration, wicking, and efflorescence.
- D. Cavities and spaces to contain reinforcement and grout
 - 1. Aligned, continuous and unobstructed; no more than 10% mortar obstruction
 - 2. 2" minimum clear in any dimension

SECTION 04200 – UNIT MASONRY

3.02 REINFORCEMENT

- A. Horizontal masonry joint reinforcement shall be placed so that longitudinal wires are located over face-shell mortar beds, and are fully embedded in mortar.
 - 1. Minimum mortar coverage: 5/8" to exterior face of wall; 1/2" all other locations.
 - 2. Lap reinforcement 6" minimum.
 - 3. Use factory-fabricated corner and intersection sections.
 - 4. Unless otherwise indicated, install horizontal reinforcement at 16" O.C. beginning with first course (8" above base of masonry).
- B. Continuity of horizontal reinforcing is required below fenestration (windows and other wall openings and penetrations).

3.03 GROUTING

- A. Spaces around openings, frames and other built-in items shall be filled solid as each course is laid.
- B. Grout all cells which occur at corners, door and window jambs, changes in parapet or foundation elevations (both sides of step), and control joints (both sides of joints).
- C. Slush fill hollow metal frames with grout at masonry and concrete walls.

3.04 CLEANING

- A. Clean new masonry per RMMI recommendations, 1 week minimum, 2 weeks maximum, after placement.
- B. Cleaning solutions shall be water-based and approved by the masonry manufacturer.
- C. Muriatic acid solutions are prohibited.

3.05 TOLERANCES

- A. Specify tolerances.

3.06 FIELD QUALITY CONTROL

- A. Contractor shall work with the Owner to schedule Owner's masonry inspections and testing.
- B. Refer to DPS Standard 04110 for other masonry testing.
- C. Owner will provide masonry prism testing and inspection for Owner's information at Owner's expense.
 - 1. A/E shall specify locations and frequency of prism testing.
- D. Contractor will be provided with Owner's testing information and may use test information as a part of Contractor's quality control. However, Owner does not represent that the frequency or type of testing is adequate to assure compliance with contract requirements. Contractor shall provide additional testing needed to assure contract compliance, at Contractor's expense.
- E. Additional tests or re-tests required for quality control shall be at Contractor's expense.

END OF SECTION 04200

SECTION 05120 – STRUCTURAL STEEL

PART 1 GENERAL

1.01 SPECIAL PERMITTING REQUIREMENTS

- A. Hotwork requirements are identified in the General Conditions of the Contract for Construction.

1.02 QUALITY ASSURANCE

- A. Comply with current recommendations of the American Institute of Steel Construction (AISC).

1.03 APPLICATOR QUALIFICATION/CERTIFICATION

- A. Welders to be employed in the work shall have certification of having satisfactorily passed appropriate American Welding Society (AWS) qualification tests within the previous 12 months.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Materials shall be provided with a shop-applied single coat of zinc chromate or red oxide paint, except:
 - 1. Steel to be encased in concrete
 - 2. Surfaces to be field welded
 - 3. Surfaces to receive fireproofing
 - 4. Steel lintels and shelf angles for masonry: Hot dipped galvanized

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

- A. Field correction of fabricated items by gas cutting shall not be permitted unless authorized by the Architect.

3.02 TESTING AND INSPECTIONS

- A. Notification: Contractor shall work with the Owner to schedule Owner's inspections and testing.
- B. Owner will provide testing and inspection services through Owner's testing agent for Owner's information.
- C. Contractor shall provide additional testing to assure compliance with the contract documents, at Contractor's expense.
- D. All test and inspection reports shall be distributed to the Contractor, Owner and Architect as soon as results are available.

END OF SECTION 05120

SECTION 05500 – METAL FABRICATIONS

PART 1 GENERAL

1.01 APPLICATOR QUALIFICATION/CERTIFICATION

- A. All welders to be employed in the work shall have certification of having satisfactorily passed appropriate American Welding Society (AWS) qualification tests within the previous 12 months.

1.02 SPECIAL PERMITTING REQUIREMENTS

- A. Hotwork requirements are identified in the General Conditions of the Contract for Construction.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Specify all materials used in metal fabrications including:
 - 1. Materials
 - 2. Gauges
 - 3. Finish (where appropriate)
 - 4. ASTM standards
 - 5. "Pot metal" (cast zinc) is prohibited
- B. Trench covers: 3/16" (minimum) checker plate steel
- C. Stage dressing supports and other overhead open grids: 1" Unistrut
- D. Grout
 - 1. Non-shrink, non-metallic
- E. Primers and protective coatings
 - 1. Shop-applied
 - 2. Do not apply primers to or galvanize areas to be welded.

2.02 RAILING FABRICATION

- A. All railings shall terminate with a closure. Provide 90 degree bend and return to walls at all railing ends unless otherwise indicated.
- B. Fabricate inside stair railings to return and connect to adjacent rails at landings.
- C. Railings parallel to walls shall have a 1-1/2" minimum clear dimension between railings and walls.
- D. Provide weep holes at the low point(s) of closed railing systems.

PART 3 PART 3 – EXECUTION

3.01 GENERAL

- A. Remove burrs and rough edges. Hem or tool exposed edges to prevent injury.
- B. Conceal screws and bolts to the greatest extent possible.
- C. Bollard installation
 - 1. Minimum embedment depth 3'-0" in concrete with 6" of concrete below embedment depth (regardless of embedment depth).
 - 2. Foundation diameter shall be 8" greater than the diameter of bollard to be installed.

END OF SECTION 05500

SECTION 06100 – ROUGH CARPENTRY

PART 1 GENERAL

PART 2 PRODUCTS

2.01 MATERIALS

- A. Dimension lumber
- B. Blocking
 - 1. Provide continuous fire-retardant treated ¾" plywood or OSB continuous lumber blocking at all mounting locations including but not limited to:
 - a. Handrails and guardrails
 - b. Door stops
 - c. Hold opens
 - d. Grab bars
 - e. Architectural specialties
 - f. Plumbing fixtures
 - g. Luminaires (wall mounted)
 - h. Surface mounted devices
 - i. Casework and shelving (wall and base cabinets at the top of each unit)
 - j. Industrial shelving
 - k. Markerboards and tackboards
 - l. Projection screens
 - m. Wall-mounted door holders (magnetic and mechanical)
 - n. Miscellaneous equipment
 - o. All other surface-mounted items as required for proper anchorage
- C. Plywood
- D. Preservative treatment
- E. Fire-retardant treatment
- F. Fasteners
 - 1. Use of percussion actuated fasteners is prohibited.
 - 2. Bronze or copper fasteners are prohibited for treated wood.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Blocking shall be continuous between studs, and continuous for the length of items to be mounted.

3.02 PRESSURE-TREATED MATERIAL

- A. Brush apply specified preservative solution liberally to all field cuts in pressure-treated material.

END OF SECTION 06100

SECTION 07840 – FIRESTOPPING

PART 1 GENERAL

PART 2 PRODUCTS

2.01 MATERIALS

- A. Materials shall conform to UL and code requirements
- B. Fire-rated Joint sealants
 - 1. Single component, neutral-curing silicone sealant
 - 2. Multi-component, nonsag, urethane sealant
 - 3. Single-component, nonsag, urethane sealant
- C. Through-wall firestop fill materials
 - 1. Single component latex elastomeric
 - 2. Single component silicone elastomeric
 - 3. Two component silicone RTV foam
 - 4. Wrap Strip and collars
- D. Mineral wool
- E. Single component mortar
- F. Accessories
 - 1. Forms
 - 2. Joint fillers
 - 3. Primers
 - 4. Sleeves
 - 5. Damming

PART 3 EXECUTION

3.01 INSTALLATION

- A. DPS reserves the right to retain the services of an independent testing agency to inspect, sample, and confirm compliance with work in this section.
- B. Notification: Contractor shall work with the Owner to schedule Owner's inspections and testing.

END OF SECTION 07840

SECTION 07920 – SEALANTS AND CAULKING

PART 1 GENERAL

1.01 Sealant and caulk applications include, but are not limited to:

1. Exterior building wall joints
2. Concrete expansion joints
3. Flashing joints
4. Door and window frame perimeters
5. Thresholds (set in full bed of compound)
6. All other seams, voids and junctures, required to be weathertight (exterior), sight-tight, sound-tight, or vapor-tight (interior)
7. Penetrations not required to be firestopped
8. Wood trim juncture to irregular wall surfaces (joints over 1/32" in width at any point)
9. Gypsum wallboard corners which are not taped
10. Junctures of dissimilar materials
11. Junctures of similar materials
12. Perimeter joints of plumbing fixtures
13. Joints between interior walls and structure not required to be firestopped
14. Pavement, curb, gutter and sidewalk joints
15. Joints of countertops and backsplashes to each other and the adjacent wall
16. Joints between exposed cabinet surfaces and the wall
17. Other joints as indicated or as required for neat appearance

PART 2 PRODUCTS

2.01 MATERIALS

A. Sealant

1. Elastomeric material to span widths from 1/16" to 3" between a variety of materials and exposure conditions with watertight, airtight, and continuous seals without staining or deteriorating adjacent construction
2. For general application, in the absence of special conditions, 1 or 2 part silicone or polyurethane sealants are preferred.
3. Preformed materials are permitted.
4. Provide self-leveling sealant for joints in horizontal surfaces.
5. Pre-compressed expanding foam sealant tape is preferred for joints over 1-1/2" wide.

B. Caulk

1. 1 part acrylic latex based mildew resistant material

C. Accessories

1. Joint primer
2. Bond breaker tape
3. Backer rod: Closed cell material only

SECTION 07920 – SEALANTS AND CAULKING

PART 3 EXECUTION

3.01 INSTALLATION

- A. Commencement of sealant and caulk work shall constitute acceptance of substrate conditions.
- B. Preparation, including cleaning, priming, and skim coating joints, is critical to joint performance.
- C. Width to depth ratios shall be per material manufacturer.
- D. Maximum sealant thickness 3/8" unless otherwise recommended by manufacturer.

END OF SECTION 07920

SECTION 08100 – HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL No standards

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. CECO
- B. Southwestern Hollow Metal
- C. Steelcraft
- D. Curries
- E. Mesker Door
- F. Metal Fusion Design

2.02 MATERIALS

- A. Hollow Metal Doors:
 - 1. Steel used in the construction of hollow metal shall be of the best quality full cold-rolled furniture stock, free from scale, buckles and pits and meet all NAAMM/HMMA Specifications.
 - 2. Hollow metal doors shall be units manufactured from 16-gauge face sheets, 16-gauge channel at top and bottom, 20-gauge internal stiffeners at 6" on center, and 8-gauge continuous edge strip, offset at hinges. 1 3/4" overall finished thickness, unless indicated otherwise by DPS prior to construction document completion.
 - 3. Door stiles shall be beveled 1/8" in 2".
 - 4. Door rails and stiles shall be continuous welded and ground smooth, with no visible seams on vertical edges.
 - 5. Exterior doors shall be insulated with expanded Polystyrene insulation.
 - 6. Doors shall be properly fabricated and reinforced to receive and coordinate with all hardware as scheduled.
 - 7. Pre-finish doors with baked on or bonderized primer.
 - 8. Doors shall be free of defects affecting appearance, operation, fit or functioning of hardware items.
- B. Hollow Metal Frames:
 - 1. Exterior and stairwell frames shall be fabricated from 14-gauge cold-rolled steel. All other frames shall be fabricated from 16-gauge cold-rolled steel.
 - 2. Frames are to be continuously electric-welded at all exposed joints, miters and stops. Miter and weld corners the full length of all exposed joint surface's full width and depth, and grind smooth.
 - 3. The lock side of the jamb of **interior** frames that are not scheduled to receive weather-stripping or smoke seals shall be prepared for rubber silencers.
 - 4. Glazing stops shall be located on the occupied (room) side of frames, unless otherwise indicated.
 - a) Unless otherwise indicated by DPS, glazing stops shall be either 3/4" x 5/8", 20-gauge standard glazing beads, continuous single piece for each length, and butted at corner joints. Secure glazing beads to frame with countersunk cadmium or counter sunk zinc-plated screws. Stops to be fabricated for installation on the inside (occupied side) of frames.
 - 5. Frames shall be properly cut, mortised, reinforced, drilled and tapped for hinges, strikes, holders where required. Do not drill and tap for surface-mounted closers and brackets.

SECTION 08100 – HOLLOW METAL DOORS AND FRAMES

- C. Reinforcing Frame:
 - 1. 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 spotwelds above and below each cutout: 6, and shall be 3/16" in diameter.
 - 2. Hinge reinforcement for metal frames:
 - a) Thickness: ¼".
 - 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
 - 3. 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.
 - 4. Strike, flush bolt, hold-open and all surface-mounted hardware: 12-gauge.
 - 5. Closer and brackets: 3/16" on frame. 12 gauge angle on door.
 - 6. For door openings wider than 42" and for multiple openings, head members shall be reinforced full-length with 12-gauge angle or channel stiffeners.
 - 7. Reinforcing plates shall be one-piece integral units, bent for flush mounting of hinges.
- D. Provide cover boxes in back of all hardware cutouts.
- E. Provide metal adjustable clip angles spot-welded to bottom of each door jamb member; provide holes in angles to receive floor anchorage.
- F. Before shipment, install a temporary spreader at bottom of door frames. Do not remove spreader until frames are secured in place.
- G. After fabrication, frames shall be cleaned and given a shop coat of red oxide primer, baked on or bonded, or a coat of gray zinc chromate rust-inhibitive flow-coat baked on primer.
- H. Frame Anchors:
 - 1. Concrete or masonry walls: UL welded-on 16-gauge adjustable strap anchors at least 2-½" x 10". Stirrup straps shall be appropriately corrugated and/or perforated.
 - 2. Metal stud wall: 18-gauge "Z" anchors securely welded to frame.
 - 3. Existing masonry openings: countersunk drilled UL-type masonry anchor, length as appropriate for permanence.
 - 4. Provide three (3) masonry anchors for frames up to 7'-6" in height, and four (4) anchors for frames up to 8'-0" in height. For masonry and frame openings over 8'-0" in height, add one (1) anchor for each 2'-0" in height or fraction thereof.
 - 5. Provide four (4) stud frame anchors for frames up to 7'-6" in height and five (5) anchors for frames up to 8'-0". For stud openings over 8'-0" in height, add one (1) anchor for each 2'-0" in height or fraction thereof.
- I. Filling Frames:
 - 1. All bolted frame anchors shall be countersunk and shall have flat-head countersunk screw heads filled and ground smooth prior to painting.

SECTION 08100 – HOLLOW METAL DOORS AND FRAMES

PART 3 EXECUTION

3.01 INSPECTION

- A. Prior to installation, hollow metal frames shall be checked. Repair all rack, twist, and out-of-square defects.
- B. Frames which cannot be repaired to new condition shall be rejected and replaced with new fabrications.

3.02 INSTALLATION (FRAMES)

- A. Field verify dimensions of existing openings to receive new hollow metal frames.
- B. Set frames carefully to exact dimensions, plumb, level, square, and true. Secure to adjacent construction. Secure each jamb base to floor with clip angle(s). Coordinate frame elevations with finish flooring thicknesses to assure proper clearances.
- C. Expansion and/or sleeve anchors with heads exposed on the frame surface shall have bolt head depressions filled and sanded so fasteners are not visible.
- D. Prepare hollow metal work to receive finish hardware.
- E. Frames installed in masonry walls shall be slushed full with grout or mortar.
- F. Gypsum Partition Frames:
 - 1. Construct one-piece metal door and borrowed light frames used with gypsum panel and gypsum-base partitions to prevent twisting or movement. Frames must be securely anchored. Partition must fit securely in frame so that wall and frame work as a unit. The frame must have throat opening between trim returns that accurately fits the overall thickness of the partition.
- G. UL-Bolted Frames:
 - 1. Install frames for concrete or masonry openings with UL bolts and sleeves. Countersink bolt heads, fill depressions and grind smooth.

3.03 TOLERANCES

- A. For doors to receive weather-stripping, clearances to frame and threshold or floor shall be according to tolerances established by the weather-stripping manufacturer for proper functioning of the installed assembly.
- B. Maximum clearances for all other doors shall be 1/8" clearance at jamb, mullion and head; 1/8" clearance at meeting stiles; 3/8" at door bottom to floor (1/4" at pairs); and 1/8" to threshold.
- C. Fire-rated doors shall be fit according to the specifications of NFPA Bulletin 80.

END OF SECTION 08100

SECTION 08210 – WOOD DOORS

PART 1 GENERAL

1.01 QUALITY ASSURANCE

- A. Doors shall conform to AWI Quality Standards, Type I glue for exterior and interior doors.
- B. Doors shall conform to ANSI/NWMA Industry Standard I.S. 1 "Wood Flush Doors" of the National Wood Manufacturer's Association and AWI Standards 1300.
- C. Doors scheduled for fire-rating labels shall be supplied with proper labels attached.
- D. Preparation of labeled fire door assemblies for locks, latches, hinges, concealed closures, glass lights, vision panels, louvers, astragals, and laminated overlays shall be performed in conformance with NFPA and UL Standards.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Algoma Hardwoods
- B. Mohawk Doors
- C. Graham
- D. Eggers
- E. Marshfield

2.02 MATERIALS

- A. Particleboard Core Doors shall be composed of 27 to 32 lb. density material, 5-ply meeting ANSI Standard 208-LD2.
- B. Stile edges shall be minimum 1-3/8" thick, made up of double-hardwood edge bands. Outer edge band shall match the face veneer for compatibility of color and grain. One tight finger-joint is allowed on one stile of each door.
- C. Top and bottom rail edge bands shall be minimum 1-1/8" thick, made of mill-option hardwood or softwood. Edge bands shall be laminated to core with highly water-resistant resin adhesive.
- D. Crossbands shall be thoroughly-dried hardwood extending full width of doors, with grain at right angles to face veneer. Crossbands and face veneer shall be laminated to cores with appropriate adhesive by hot plate process. Crossbands concealed at edges.
- E. All wood door veneers shall match existing.
- F. For new buildings and additions all wood doors shall be pre-finished with a water bourn polyurethane.

2.03 FABRICATION

- A. Fabricate fire-rated doors to comply with current NFPA and UL Standards.
- B. Factory machine wood doors completely mortised, rabbeted, and drilled to receive scheduled hardware. Size to suit scheduled sizes, allowing industry standard clearances. Bevel both edges at the rate of 1/8" in 2". Pre-machining shall not be performed for surface-mounted hardware.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Align doors to frame for uniform clearances as follows:
 - 1. Head and jamb: 1/8".
 - 2. Bottom: 3/8" (maximum) to finish floor, 1/8" to threshold.
 - 3. Meeting stile: 1/8".
 - 4. Fire-rated assemblies: per NFPA Bulletin 80.

SECTION 08210 – WOOD DOORS

3.02 STORAGE

- A. Doors shall be stored and handled per manufacturer's guidelines.

END OF SECTION 08210

PART 1 GENERAL

1.01 COORDINATION

- A. Coordinate Owner's keying requirements with the supplier. Because of existing security arrangements, no substitutions will be accepted for specified cylinders.

1.02 REGULATORY REQUIREMENTS

- A. Openings designated to be fire-rated shall be provided with Finish Hardware complying with NFPA standards 80 and 101. This requirement shall take precedence over all other requirements for such hardware. Provide only listed, tested and approved Finish Hardware compatible with proposed size, type, function, and location of such doors.

1.03 SUBMITTALS

A. SHOP DRAWINGS AND PRODUCT DATA

- 1. Submit final hardware schedule to Architect. Indicate complete designation of every item required for each door or opening, arranged into hardware sets.
- 2. Submit complete product data to Architect for each hardware item. Provide manufacturer's cut sheet(s) for each item.
- 3. The Architect shall forward a copy of the Hardware submittals to the DPS Project Manager for simultaneous review.

1.04 SEQUENCING/SCHEDULING

- A. Hardware-related submittals shall be submitted to the Architect within 20 calendar days of the Notice to Proceed.
- B. Hardware items shall be ordered from the manufacturer within 10 days of submittal acceptance.

1.05 ARCHITECT NOTIFICATION

- A. The Contractor shall be responsible for notifying the Architect of any Finish Hardware item which is inappropriate for designated fire protection rating. Such notification shall be given prior to purchase of any component of the affected opening.

1.06 EXTENDED WARRANTY

- A. Submit to the Architect copies of Finish Hardware manufacturer's standard guarantees as follows:
 - 1. All hardware items: ten (10) year guarantee (all parts)
 - 2. Closers: ten (10) year replacement guarantee against mechanical failure.
 - 3. All locksets shall have a Lifetime warranty.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Acceptable manufacturers of products shall be as indicated in this section.
- B. Material suppliers shall have a supply warehouse located within 100 miles of the project site.

2.02 MATERIALS

A. FINISH

- 1. Finish hardware shall be US26D finish only.

B. CLOSER SHELLS:

- 1. Finish of closer shells shall be lacquer or enamel finish to match other hardware.

2.03 KEYS

- A. All keys provided shall be nickel silver alloy.
- B. Deliver construction core keys to the General Contractor.
- C. Deliver keys to the DPS Structural Department (only) in individual envelopes marked with door number and room number.
 - 1. DPS Structural Department will control key distribution. The DPS Structural Department will assure that the Building Grand Master keys are only provided to DPS Security and the Denver Fire Department (Knox Box).
- D. Keys shall be permanently engraved with appropriate identification number.
- E. Provide the quantity of keys as indicated on the key schedule.
- F. In addition to scheduled keys, provide:
 - 1. 8 interior master keys
 - 2. 8 exterior master keys
 - 3. 3 building grand master keys
 - 4. Five (5) change keys shall be furnished with each key change.
 - 5. Ten (10) construction keys (keyed to construction cores).
 - 6. Two (2) construction core control key (for removal of construction cylinder cores at the time of final keying).
 - 7. Locksets shall be furnished with temporary construction keying during construction period.

2.04 CYLINDERS

- A. Cylinders shall be “interchangeable/removable core” cylinders (I-Core) with restricted keyway as designated by DPS Structural department only.
- B. Provide construction cores for all locksets to be installed under this project. Construction cores shall NOT be provided with the restricted keyway. Construction cores shall be returned to the Contractor after the permanent cores have been installed in the building.
- C. Existing cylinders manufacturer, Keyway number, restricted keyway designation, etc. will be provided by the DPS Structural Department. New cylinders in existing buildings shall match existing interchangeable/removable core keyways for those buildings. Master keying pin combinations will be provided to the hardware supplier by the DPS lock shop through the DPS Project Manager.

2.05 HINGES

- A. Butt Hinges:
 - 1. 5-knuckle, full ball-bearing hinges.
 - 2. Only exterior door hinges shall have non-removable pins.
 - 3. Hinges for interior doors over 3'-0" in width shall be 5 x 5 minimum.
 - 4. Interior door hinges (3'0" and less in width) shall be 4-1/2 x 4-1/2 minimum.
 - 5. Provide 1-1/2 pair of butts for each door leaf up to and including 7'-0" in height.
 - 6. Provide 1/2 pair butts for each additional 2'-0" in height or portion thereof.

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2.06 STOPS: All stops shall have cast escutcheons with brushed chrome finish and rubber bumpers (except as otherwise indicated herein).

2.07 LOCK FUNCTIONS

ITEM	MANUFACTURERS / FUNCTIONS		NOTES
Cylindrical Lock Functions			
Trim Design	Best 15D	Marks American (1)	
Interior Storerooms/workrms			
General (Staff Access)	93K 0 IN 15D S3 626	195 RDB 626 *	Classroom Intruder
Individual Classroom Strg	93K 0 R 15D S3 626	195 RS 626 *	Classroom (standard)
Custodial and Utility	93K 0 D 15D S3 626	195 RF 626 *	Storeroom
Int. Storerm./workrm. (Dbl. Dr.)			
Active Leaf	93K 0 D 15D S3 626	195 RF 626 *	Storeroom
Inactive Leaf (non-rated)	Cremona Bolt	Cremona Bolt	Cremona Bolt
Inactive Leaf (rated)			
Telecommunication Rooms	Same as storeroom function above with Best cylinder. No substitutions.		
Classrooms/Offices	93K 0 IN 15D S3 626	195 RDB 626 *	Classroom Intruder
Toilets			
Private Staff	93K 0 L 15D S3 626	195 L 626	Privacy
Corridor Access, Staff	93K 0 E 15D S3 626	195 RBS 626*	Service Station
Student Toilets			
Kindergarten/ECE	93K 0 N 15D S3 626	195 N 626	Passage
Deadbolt Functions			
Ext. Storerooms (Single)	83T 7 K STK 626	130 RK 626	Single Cyl Deadbolt
Utility Doors (Restricted)	83T 7 S STK 626	130 RS 626	Classroom Deadbolt
Ext. Storerooms (Dbl. Dr.)			
Active Leaf	83T 7 K STK 626	130 RK 626	Single Cyl. Deadbolt
Inactive leaf	Cremona Bolt	Cremona Bolt	
Non-rated Interior Storage			
Gym/Cafeteria Storage	83T 7K STK 626	130 RK 626	Single Cyl Deadbolt
(Inactive Leaf)	Cremona Bolt	Cremona Bolt	

SECTION 08700 – HARDWARE

2.08 Panic Devices

PANIC HARDWARE

Manufacturer	VON DUPRIN	NOTES
TRIM DESIGNATION	L03 CAST	DOUBLE CAST LEVER, WROUGHT ROSE
LOCATIONS	FUNCTIONS	
BUILDING ENTRY	99NL x 99DT	ONE KEYED DOOR ONLY, PULLS
EXTERIOR SINGLE KEYED	99NL	
EXTERIOR LEVER ENTRY		RIM W/ LEVER (KEYED)
EXTERIOR (EXIT ONLY)	99EO	
INTERIOR SINGLE (NON-RATED)	99DT	RIM W/ DUMMY TRIM - DOGGABLE
INTERIOR SINGLE (RATED)	99L-BE-F	RIM W/ LEVER ALWAYS ACTIVE
INTERIOR SINGLE	99L-F	RIM W/ LEVER (KEYED)

Manufacturer	DORMA	PRECISION (APEX)		NOTES
TRIM DESIGNATION	YT (SOLID CAST)	9L		DOUBLE CAST LEVER, WROUGHT ROSE
LOCATIONS	FUNCTIONS			
BUILDING ENTRY	9300BxV103M x 9300BxV102	1103x20C x 1102x20C		ONE KEYED DOOR ONLY, PULLS
EXTERIOR SINGLE KEYED	9300BxV103M	1103x20C		
EXTERIOR (EXIT ONLY)	9300B x No Trim	1101		
INTERIOR SINGLE (NON-RATED)	9300B x YT08	1108x9L		RIM W/ DUMMY TRIM - DOGGABLE
INTERIOR SINGLE (RATED)	F9300B x YT08C	FL1108Ax9L		RIM W/ LEVER ALWAYS ACTIVE
INTERIOR SINGLE	F9300B x YT08C	FL1108x9L		RIM W/ LEVER (KEYED)
INTERIOR PAIRS (NO MULLION)				

2.09 ELECTRIC STRIKES

- A. No electric strikes allowed.

2.10 STRIKES

- A. All T-strikes shall have a strike box.

2.11 PUSH/PULLS:

- A. Push / pull plates shall be 4" x 16" with a 1 3/4" door pull and an 8" center.
- B. Pulls shall be through-bolted at 2-points (minimum).
- C. Pulls shall be ADA compliant.

2.12 KICKPLATES

- A. 16 ga. stainless steel.
- B. 12" high unless otherwise indicated
- C. door width less 2"
- D. mounted 1/2" above bottom of door

2.13 ARMOR PLATE (for service, kitchen and delivery doors):

- A. 14 ga. Stainless steel
- B. 32" high unless otherwise indicated

- C. Door width less 1-1/2 inches
- D. Mounted ½” from bottom of door.

2.14 THRESHOLDS:

- A. extruded aluminum
- B. full width of opening (no splices in width)
- C. not cut for removable mullion floor plates
- D. Acceptable products:
 - 1. Von Duprin
 - 2. Corbin
 - 3. Russwin
 - 4. Sargent
 - 5. Pemko
 - 6. Master
 - 7. Hager

2.15 CLOSERS

- A. General
 - 1. LCN 4040 XP HEDA ST3596 – TBWMS with heavy duty, high security arms
 - 2. Sargent #281xP10 series closers with heavy duty, high security arms
 - 3. Parallel arm mounting only. “Cush Arms” are not allowed.
- B. Power Operated Closers (ADA Entrance)
 - 1. Dorma ED800 only.

2.16 STOPS:

- A. Wall Stops - Interior:
 - 1. Glynn-Johnson WB50, WB 50XT, or equal by
 - 2. Trimco
 - 3. Master Manufacturing
 - 4. Hager 233W/232W
- B. Wall Stops - Exterior (cast bronze):
 - 1. Wall stops shall be mounted at appropriate height on a 42” high 2 x 2 gouted ballard.
- C. Floor Stops - Exterior (cast bronze):
 - 1. Must use a FS18L or similar.

2.17 KNOX BOX (for Fire Department): Knox #3220xRMK (recessed mounting kit) or Knox #3200 (surface mounting)

2.18 WEATHER-STRIPPING:

- A. Vinyl Smoke Seal
 - 1. Adhesive backed preformed copolymer weather-strip for metal frames; PemkoFlex PF114 PS (head + jamb) or equivalent by Hager (727S).
- B. Silicone Smoke Seal

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1. Pemko S88D204 silicone smoke gasket
2. Hager (726S)
- C. Exterior Door Weatherstripping:
 1. Head and Jambs - (extruded aluminum with closed cell insert) x US26D
 - a) Pemko 303 AS or similar.
 - b) Hager (757SN)
 2. Sill - Pemko 368 CN (extruded aluminum w/ neoprene insert)
 3. Meeting Stile (rated): No preference. Provide appropriate product.

2.19 MISCELLANEOUS

- A. Silencers:
 1. Typical, 3 ea. at latch jamb of all doors (except weather-stripped).
- B. Cremona Bolt
 1. Controlled Products Corp #1028.00310.008
- C. Key Cabinets
 1. Steel cabinets designed specifically for key storage.
 2. Provide cabinet locking cylinders. If more than one cabinet is required to accommodate the quantity of keys to be stored, provide cabinets with door cylinders keyed the same.
 3. Provide key tags (unlabeled), key hooks and other accessories required for fully functional system.
 4. Key cabinets shall be wall mounted.
 5. Quantity of keys to be stored: Provide cabinet storage for 200 for Elementary Schools. Provide Cabinet storage for 300 keys for Middle Schools and K-8 Schools. Provide cabinet storage for 500 keys for High Schools.

2.20 SPARE PARTS

- A. Provide one spare interchangeable/removable core for each 50 cylinders provided to a maximum of 6 spare interchangeable/removable cores per project.
- B. Provide spare restricted keyway key blanks at a rate of 1 for each 10 cylinders provided to a maximum of 50 key blanks per project.

PART 3 EXECUTION

3.01 PREPARATION

- A. No manufacturing orders shall be placed until a detailed schedule has been submitted to the Architect and written review returned.
- B. Furnish hardware templates to each fabricator of doors, frames, and other work to be factory-prepared for the installation of hardware. Upon request, check the shop drawings of such other work to confirm that adequate provisions will be made for the proper installation of hardware.

3.02 FIELD MEASUREMENTS

- A. Field verify all dimensions of existing doors and frames to receive new hardware.

3.03 INSTALLATION

- A. MOUNTING:
 1. General:

SECTION 08700 – HARDWARE

- a) WOOD DOORS: Mount hardware to wood doors and wood transom panels with sex bolts.
- b) HOLLOW METAL DOORS: Mount hardware to metal doors with sex bolts.
- 2. Silencers
 - a) Install three (3) rubber door silencers to latch side of each metal door frame unless frame is to receive weather-stripping or smoke seals.
- 3. Closers:
 - a) Mount to wood doors with through bolts and grommet nuts.
 - b) Mount to hollow metal doors with through bolts and grommet nuts.
 - c) Masonry and concrete:
 - i) Mount hardware to concrete and brick masonry with cast-in or built-in anchors.
 - ii) Where cast-in or built-in anchors are not possible, mount hardware to concrete and brick masonry with drilled expansion anchors.
 - iii) Mount hardware to hollow masonry with toggle bolts.
- 4. Mount hardware to gypboard and plaster framed partitions with wood screws through to solid blocking. Provide plaster rings behind all surface door stops.
- 5. Sill sweeps: Where sill sweeps are mounted on doors with continuous hinges, hinge shall be stopped above bottom of door so that the sweep can be mounted full door width.

3.04 MOUNTING HEIGHTS:

A. Hardware shall be mounted at the following heights (center line) unless indicated otherwise:

Item:	Kindergarten	Other
Lever Set	36"	36"
Push Plates	39"	46"
Pulls	36" to bottom of pull	39" to bottom of pull
Exit Devices	36"	39"

B. Where needed in remodel and small addition projects, match existing hardware heights.

3.05 TOLERANCES

- A. Door undercuts shall not exceed 1/2" (3/8" at thresholds) unless otherwise noted.
- B. Door fit tolerances for all doors must meet NFPA requirements.
 - 1. Jamb to door style -- 1/8" maximum.
 - 2. Head to door head -- 1/8" maximum.
- C. Full length (continuous) hinges shall not be installed with any shims, etc. to adjust door fit.

3.06 ADJUSTING AND CLEANING

- A. Clean, adjust, and lubricate each hardware item in final building environment (air handlers running, smoke seals installed).
- B. Check for proper operation.

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- C. Replace items that cannot be adjusted to operate as intended.
- D. Self-closing door devices shall be adjusted to the specifications of appropriate Building Code and/or Fire Officials.
- E. Adjust closer spring tension, closer speed, backcheck and latch speed for each device per manufacturer's installation instructions.

END OF SECTION 08700

PART 1 PRODUCTS

1.01 ACCEPTABLE MANUFACTURERS – GLASS

- A. General Glass Company
- B. Pilkington
- C. PPG
- D. Other generally recognized manufacturers of glass and glazing products.

1.02 ACCEPTABLE MANUFACTURERS - PLASTIC GLAZING

- A. Lexan

PART 2 MATERIALS

2.01 GLAZING

- A. Designated or required by code to be cermaic or laminated fireglass. ie FIRELITE
- B. Restroom glazing to be obscure glass. Obscure pattern shall be P62.

2.02 SAFETY GLAZING

- A. Safety glazing shall be 1/4" horizontal tempered clear glass with manufacturer's etched identification marking.

2.03 PLASTIC GLAZING

- A. Plastic glazing shall be 1/4" (minimum) Lexan MR-5 mar resistant glazing.

PART 3 EXECUTION

3.01 SAFETY GLAZING

- A. Safety glazing shall be installed in all openings within doors, at all glazed openings within 12 inches of door openings where the bottom edge is less than 5 feet from the floor, and at all fixed glazed openings of more than 9 square feet where the lower edge of the glazed panel is less than 18 inches above the adjacent floor level (except where the panel is protected by a horizontal member located between 24 inches and 36 inches above the adjacent floor).
- B. Where fire rated openings are required, wire glass shall be installed at all glazed openings. Wire glass may be considered to meet the requirements of safety glazing only where protection of openings is required.

END OF SECTION 08800

SECTION 09110 – METAL STUD FRAMING SYSTEMS

PART 1 GENERAL

1.01 SUBMITTALS

- A. Shop Drawings, UL and typical bracing details from the manufacturer.
- B. Product Data to include unsupported lengths and gauges.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Ceiling Suspension Main Runners: 1.5" steel channels, .0475 lb. Per foot, cold rolled
- B. Hanger Wire: ASTM A641, Class 1 zinc coating, soft tempered, 8 gauge.
- C. Furring Members: ASTM C645 25 gauge (0.0179"), hat-shaped, 7/8" deep.
- D. Steel Studs: ASTM C645, 25 gauge (0.0179") x 3 5/8" deep, except as otherwise indicated on the drawings.
 - 1. At door jambs and for tile backing, use 20 gauge (0.0329")
 - 2. Runners: match studs, type recommended by stud manufacturer for floor and ceiling support of studs and for vertical abutment.
- E. Deflection Track: Manufacturer's standard top runner designed to prevent cracking of gypsum board and plaster applied to interior partitions resulting from deflection of the structure above. Flanges have either V-shaped offsets that compress when pressure is applied from construction above or have slots 1 inch o.c. that allow fasteners attached to studs through the slots to accommodate structural movement by slipping.
- F. Bracing shall be the same gauge as studs.
- G. Screws shall be corrosion resistant and self tapping.
- H. Shaft Wall framing members shall be minimum 25 ga. galvanized. Shape, assembly and gauges shall conform with the UL assembly where shafts are required to have a fire-rated construction.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Refer to Division 1 requirements where metal stud erection will occur in occupied buildings.
- B. Install Supplementary framing, fire treated blocking, and bracing to support fixtures, hardware, equipment, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Only brace to structural elements (joist, beams, etc.)
- C. Installation tolerances:
 - 1. Install each steel framing and furring member so that fastening surfaces do not vary more than 1/8 inch from plumb and from the plane formed by the faces of adjacent framing.
 - 2. Install steel framing components for suspended ceilings so that cross-furring members are level to within 1/8 inch in 12 feet as measured both lengthwise on each member and transversely between parallel members.
 - 3. Maximum out-of-plumb or line of framing permissible is 1/8" in 12' and 1/4" overall.
 - 4. Maximum out-of-square or designated line permissible is 1/8" in first 15' from corner and maximum 1/4" overall.
- D. Install steel studs 16 inches o.c. unless otherwise indicated.
- E. Stud splicing is prohibited.
- F. Do not connect or support steel framing from ducts, pipes, conduit or metal deck.
- G. Door jambs shall be 20 gauge, doubled, and attached to one another and run full height to structure.

SECTION 09110 – METAL STUD FRAMING SYSTEMS

- H. Do not bridge structure.
- I. Coordinate with spray on fire insulation to avoid damage and major repairs.
- J. Install fire safing materials in all deflection tracks in fire rated partitions.

END OF SECTION 09110

PART 1 GENERAL

1.01 QUALITY ASSURANCE

- A. Comply with ASTM C 926 for Cement Plasters.
- B. Comply with ASTM C 841 for Interior Lathing and Furring.
- C. Comply with ASTM C926 for Interior Cement Plaster.
- D. Comply with ASTM C 847 for metal lath.

1.02 SUBMITTALS

- A. Shop Drawings showing layout of control joints.
- B. Installation Instructions and product data.
- C. Samples of each face materials, texture and accessory to be utilized

PART 2 PRODUCTS

2.01 MATERIALS

- A. Metal Lath
 - 1. Diamond Mesh Lath: Expanded metal lath with 5/16 inch wide diamonds.
 - 2. Self-Furring Lath: Expanded metal lath with 5/16 inch wide diamonds with self-furring dimples to hold the lath ¼ inches away from substrate.
 - 3. Rib Lath: Expanded metal with 1/8 inch deep solid metal ribs and 1 ½ inches o.c.
 - 4. Rib Lath: Expanded metal with opposed, U-shaped, 3/8 inch deep, solid metal ribs at 1- 15/16 inches o.c.
- B. Trim –including but not limited to:
 - 1. Expansion joints
 - 2. Casing Beads
 - 3. Corner Beads
 - 4. Reglets
- C. Cement Plaster
 - 1. Base Plaster:
 - a. Cement neat plaster
 - b. Cement plaster with mill-mixed perlite aggregate.
 - 2. Finish Plaster:
 - a. Cement gauging plaster
 - b. Cement molding plaster
 - 3. Exterior Plaster:
 - a. Exterior applications for soffits are to be cement plaster only, white Keene Cement finish coat, smooth finish, not paint.

2.02 FINISHES

- A. Metal Lath
 - 1. Painted
 - 2. Galvanized

SECTION 09200 – LATH AND PLASTER

- B. Trim
 - 1. Zinc Alloy
 - 2. Galvanized
- C. Cement
 - 1. Smooth, non-painted

PART 3 EXECUTION

3.01 INSTALLATION

- A. Three coat process
- B. Tolerances: For flatness of surface, do not exceed $\frac{1}{4}$ inch in 8 feet for bow or warp and for plumb and level.
- C. Follow manufacturer's guidelines for environmental conditions for installation

END OF SECTION 09200

SECTION 09250 – GYPSUM WALLBOARD

PART 1 GENERAL

1.01 QUALITY ASSURANCE

- A. Provide assembly ratings and numbers as designated by UL, Warnock Hersey or other testing agencies accepted by the Denver Building Department.
- B. Provide all Gypsum board from a single source.
- C. Impact resistance for Abuse Resistant- no failure after 100 impacts when tested with ASTM E 69 modified.

1.02 SUBMITTALS

- A. Shop Drawings showing layout of control joints.
- B. Installation Instructions and product data.
- C. Samples of each face materials, texture and accessory to be utilized
- D. Manufacturer's certification that gypsum is free of asbestos.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Gypsum Board –beveled tapered edge.
 - 1. 5/8" Type ' X '
 - 2. 5/8" Abusive Resistive type ' X '.
 - 3. Exterior sheathing shall be water resistant material only.
 - 4. Tile backer board: Fiber reinforced cement boards, 1/2" minimum thickness. Comply with fire rating requirements where required.
- B. Trim –including but not limited to:
 - 1. Expansion joints
 - 2. Reveals
 - 3. Corner Beads
 - 4. Acoustical
- C. Joint Treatment
 - 1. Joint Tape
 - 2. Joint Compound
 - 3. Wet area- use fiberglass mesh joint tape and chemically cured joint compound.
 - 4. Provide casing beads at joints of dissimilar materials and recessed items such as cover plates.- provide detail.
- D. Acoustical sealants
 - 1. Caulk
 - 2. Closed cell foam tape
- E. Sound Insulation
 - 1. Un-faced fiberglass 2" minimum sound batts.

SECTION 09250 – GYPSUM WALLBOARD

2.02 FINISHES

- A. Trim
 - 1. Painted
 - 2. Zinc Alloy

 - 3. Galvanized
- B. Gypsum
 - 1. Smooth, skim coat
 - 2. Sprayed on Texture
 - a. walls
 - b. ceiling

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install all gypsum board and trim accessories in strict conformance to manufacturer's installation instructions and meeting finishing standards ASTM C 840 and GA-216 and as specified herein.
- B. Finishing of assemblies
 - 1. General: Apply joint treatment at gypsum board joints (both directions); flanges of corner bead, edge trim, and control joints; penetrations; fastener heads, surface defects; and elsewhere as required to prepare gypsum board surfaces for decoration and levels of finish indicated.
 - 2. Pre-fill open joints, rounded or beveled edges, and damaged areas using setting type joint compound.
 - 3. Apply joint tape over gypsum board joints except those with trim accessories having concealed face flanges not requiring taping to prevent cracks from developing in joint treatment at flange edges.
 - 4. Provide one of the following levels of finish.
- C. Levels of finish (GA-216)
 - 1. Level 1: Plenums and service corridors
 - 2. Level 2: Water resistant gypsum backing board scheduled to receive tile.
 - 3. Level 3: Gypsum board scheduled to receive heavy or medium textured coatings and heavy-grade wall coverings.
 - 4. Level 4: Gypsum board scheduled to receive light textured coatings and light-grade wall coverings.
 - 5. Level 5: All other gypsum board.
 - a. For level 5 finish, embed tape in joint compound and apply three separate coats of joint compound over joints, angles, fasteners heads, and accessories. Touch up and sand between coats and after last coat as needed to produce a surface free of visual defects and ready for decoration. Use the following joint compound combinations:
 - 1) Embedding and first coat: Ready-mixed, drying type, all purpose or taping compound
 - 2) Fill (Second coat)L Ready-mixed, drying type, all purpose or topping compound.
 - 3) Finish (Third coat): Ready-mixed, drying type, all purpose or topping compound.

END OF SECTION 09250

PART 1 GENERAL

1.01 QUALITY ASSURANCE

- A. Furnish tile conforming with Standard Grade requirements of ANSI 137.1
- B. Conform to Tile Council of America "Handbook for Ceramic Tile Installation" and ANSI A108, A118 and A136 as applicable.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Daltile
- B. Capco
- C. American Olean

2.02 MANUFACTURERS

- A. Provide only domestically manufactured ceramic and quarry tiles
- B. Provide tile-setting and grouting material as approved by tile manufacturers

2.03 MATERIALS

- A. Unglazed Quarry Tiles:
 - 1. Composition: non abrasive smooth face quarry tile.
 - 2. Module Size: 8 by 8 or 6 by 6 inches
 - 3. Nominal Thickness: 3/8"
 - 4. Face: Plain w/relieved edges.
- B. Unglazed Ceramic Tiles:
 - 1. Composition: non-abrasive porcelain .
 - 2. Module Size: 2 by 2 inches (or larger) If approved by DPS Project Manager.
 - 3. Nominal Thickness: 1/4"
 - 4. Face: Plain with cushion edges.
- C. Glazed Wall Tile:
 - 1. Composition: Porcelain
 - 2. Module Size: 4.25" x 4.25"
 - 3. Nominal Thickness: 5/16"
 - 4. Face: Matte glaze finish, cushion edge.
- D. Trim Shapes: As required for a complete installation, of same material, size, color and finish of field tile. Provide shapes from manufacturer's standards as follows:
 - 1. Wainscot Cap: Surface bullnose.
 - 2. Base: Butt Cove base
 - 3. In-Corner: Manufactured inside trim with coved base and cap angle pieces to match with stretcher shape.
 - 4. Out-Corner: Manufactured outside trim.
 - 5. Jambs: Surface bullnose where tile projects from jamb.
- E. Waterproofing For Thinset Tile: One-part liquid-applied urethane in a consistency suitable for trowel

SECTION 09300 – CERAMIC TILE

application and intended for use as both waterproofing and tile-setting adhesive in a two-step process.

- F. Setting Materials: Latex-modified, acrylic based portland cement thinset mortar complying with ANSI A118.4.
- G. Grouts:
 - 1. For all floors and walls : epoxy grout (pigmented).
- H. Floor Leveling Compound: Multi-purpose acrylic latex admixture with a maximum depth of ¾” and a minimum compressive strength of 3700 psi. Complying with ASTM-C190, ASTM D-3931, ASTM C-109.
- I. Backing/Substrate material: use appropriate water resistant materials such as cement board.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Comply with manufacturers instructions and applicable ANSI standard installation specifications series A108, A118 and A136.
- B. Maintain minimum temperature limits and installation practices as recommended by proprietary mortar and grout materials manufacturer.
- C. Unless otherwise noted, lay tile in grid pattern. Align joints when adjoining tiles on floor, base, walls and trim are the same size.
- D. Provide joint width of 1/16" to 0.125" for ceramic tile, ¼” for quarry tile.
- E. Install tile per Tile Council of America methods appropriate to substrate.
- F. Provide expansion and control joints per Tile Council of America EJ171 and A3.4 of ANSI A1008 series.- use one-part pourable urethane sealants for expansion and control joints.
- G. Installation of floor tile over existing flooring of any type is prohibited. NO EXCEPTIONS

3.02 MAINTENANCE STOCK

- A. Furnish 2% each type, color and size of tile used on the project, with a minimum of 20 square feet provided. Supply in boxes clearly marked as to contents and coordination with designation on specifications and drawings.
- B. Furnish 12 extra pieces of each special shape tile type and color used.

END OF SECTION 09300

SECTION 09644 – WOOD FLOORING ASSEMBLIES

PART 1 GENERAL

1.01 QUALITY ASSURANCE

- A. Installer Qualifications: an experienced installer, with not less than five (5) years experience, acceptable to the manufacturer of the flooring system, who has completed wood flooring installations similar in material, design, and extent to that indicated for this Project and whose work has resulted in wood installations with a record of successful in-service performance.
- B. Flooring system shall be Acer Cush II or equal.
- C. Installer's Responsibilities: installation of flooring assembly, including the following.
 - 1. Vapor barrier and shock absorbency.
 - 2. Subfloor.
 - 3. Wood finish flooring.
 - 4. Game lines and markers.
 - 5. Finish.
 - 6. Accessories.
- D. Maple Flooring: comply with MFMA grading rules for grade and cut.
- E. Certification: provide flooring that carries MFMA Certification Mark on each piece.

1.02 SUBMITTALS

- A. Product Data: for each type of product indicated.
- B. O & M Information
- C. Shop Drawings: show installation details including location and layout and direction of each type of wood and accessories. Include the following.
 - 1. Expansion provisions and trim details.
- D. Samples for Selection: manufacturer's color charts showing colors and glosses available for the following.
 - 1. Floor finish.
- E. Installer's qualifications

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. General: wood flooring is restricted to products/systems with at least five (5) years of successful history in institutional applications in Colorado.
- B. Available Manufacturers: subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following.
 - 1. Wood flooring assemblies
 - a) Acer
 - b) Action
 - c) Robbins

2.02 MAPLE FLOORING

- A. Strip flooring: northern hard maple (*Acer saccharum*), kiln dried.
 - 1. Grade: First, unless otherwise indicated and approved by DPS Project Manager.
 - 2. 7% maximum moisture content.
 - 3. Cut: edge grain.

SECTION 09644 – WOOD FLOORING ASSEMBLIES

4. Lengths: nominal 15" to 96" (381 to 2440 mm) complying with MFMA grading rules, unless otherwise required for patterns indicated.
 5. Matching: tongue and groove, and end matched.
 6. Backs: channeled (kerfed) for stress relief.
 7. Thickness: 25/32" (20mm).
 8. Face width: 2-1/4" (57mm).
- B. Preservation Treatment: clear, penetrating, water-repellent wood preservative that protects against mold, mildew, staining, and decay fungi; complying with MFMA's written recommendations and applied by immersion.

2.03 WOOD SUBFLOOR SYSTEM

- A. Sleepers: 2" x 4" fir or pine, KD, preservative dip treated with Woodlife preservative.
- B. 6 mil poly vapor barrier.
- C. Cush pads.
- D. Fasteners and Accessories: as recommended by system manufacturer.
- E. 2 layers of Apa underlayment 15/32"

2.04 FINISHING MATERIALS

- A. Floor-Finish System: MFMA-listed system of water base recommended by flooring and finish manufacturers for application indicated. Use Betco Hydro Line Wood Floor Coating, Basic Sports Coatings "Street Shoe".

2.05 ACCESSORY MATERIALS

- A. 6 mil poly
- B. Fasteners: type and size recommended by manufacturer, but not less than those recommended by MFMA for application indicated.
- C. Vented base.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas and conditions, with Installer present for compliance with requirements, installation tolerances, moisture, and other conditions affecting performance of wood flooring assembly. Proceed with installation only after unsatisfactory conditions have been corrected.
 - B. Concrete Slabs: verify that concrete slabs comply with requirements specified in Section 03300, "Cast-in-Place Concrete."
 1. Grind high spots and fill low spots to provide a maximum 1/8" (3-mm) deviation in any direction when checked with a 10' (3-m) straight edge. Coordinate with concrete specification.
2. Verify that slabs are dry according to test methods recommended in writing by flooring manufacturer. (installer is to to the testing).

3.02 PROJECT CONDITIONS

- A. Concrete Curing: do not install wood floor until concrete slab has cured for a minimum of 60 days.
- B. Conditioning: permanent heat shall be installed and operating during and after installation. Maintain ambient temperature between 55°F and 80°F prior to, during, and after flooring installation.
 1. Open sealed packages to allow wood flooring to acclimatize (7 days).
 2. Do not install flooring until it adjusts to the relative humidity of and is at the same temperature as the space where it is to be installed.

SECTION 09644 – WOOD FLOORING ASSEMBLIES

3. Close spaces to traffic during flooring installations and for the time period after installation recommended in writing by flooring and finish manufacturer, but not less than 10 days.

3.03 INSTALLATION

- A. General: comply with flooring-assembly manufacturer's written instructions, but not less than recommendations of MFMA applicable to flooring type indicated.
- B. Install 6 mil poly vapor barrier.
- C. Install sleepers across the short dimension of room (or at right angles to the main playing court) 16" on center with ends futed and joints staggered. Provide 2" expansion voids at the perimeter and all vertical obstructions. Accurately level and shim sleepers firmly at each anchor point 24" on center. Drive pin head to be flush with top surface of sleepers.
- D. 2 layers of APA underlayment
- E. Deliver wood flooring materials in unopened cartons or bundles.
- F. Protect wood flooring from exposure to moisture. Do not deliver wood flooring until after concrete, masonry, plaster, ceramic tile, and similar wet work is complete and dry.
- G. Store wood flooring materials in a dry, warm, well-ventilated, weather-tight location.
- H. Move wood flooring into space where it will be installed at least several days before installation.
- I. Install flooring by power nailing or stapling approximately 12" on center. Provide 1" expansion voids at the perimeter and all vertical obstructions. Stagger end joints at least 6".
- J. No short boards are permitted at doorways.

3.04 SANDING AND FINISHING

- A. Allow installed flooring to acclimate to ambient conditions for at least 10 days before sanding.
- B. Machine sand with coarse, medium, and fine grades (100 grit) of sandpaper to achieve a level, smooth, uniform surface without ridges or cups. Remove sanding dust by tack or vacuum and immediately apply finish.
- C. Finish: apply seal and finish coats of finish system according to manufacturer's written instructions. Provide not less than four (4) coats total and not less than two (2) finish coats.
 1. Apply floor sealer in two (2) coats in accordance with manufacturer's instructions, including machine buffing with steel wool, in-the-wet where recommended by manufacturer. Apply floor finish in two (2) coats minimum in accordance with manufacturer's instructions, buffing after each coat.
 2. Install base molding and other cover trim indicated for expansion spaces at edges and interruptions of flooring.
- D. If a paint is requested to be used on a stage floor it shall be black matte water borne pre-catalyzed urethane floor enamel.

3.05 PROTECTION

- A. Protect wood flooring during remainder of construction period to allow finish to cure and to ensure that flooring and finish are without damage or deterioration at time of Substantial Completion.

END OF SECTION 09644

PART 1 GENERAL

1.01 QUALITY ASSURANCE

- A. Provide all resilient flooring and accessories from a single source .

1.02 SUBMITTALS

- A. Record finish schedule including material and color designations

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

- A. Vinyl composition tile
 - 1. Armstrong
 - 2. Tarkett
 - 3. Mannington
 - 4. Burke
- B. Rubber tile
 - 1. ECOsurfaces
 - 2. Endura
 - 3. Burke
- C. Trim accessories
 - 1. Armstrong
 - 2. AFCO
 - 3. Johnsonite
 - 4. Musson Rubber
 - 5. Roppe
 - 6. Burke

2.02 MATERIALS

- A. Tile
 - 1. Vinyl composition tile: 12"x 12"
 - 2. Rubber tile: 18 "x 18"
 - 3. Minimum tile thickness: 1/8"
 - 4. Pattern and color must extend the full thickness of tile
 - 5. Provide tile coming from the same dye lots for the entire project.
- B. Wall base
 - 1. Material: Rubber only (vinyl prohibited)
 - a) 4'-0" lengths only (No coil).
 - 2. Topset cove
 - 3. Flat base is prohibited.
 - 4. 4 inch high
 - 5. 90 degree outside corners shall use pre-formed corner pieces.

SECTION 09650 – RESILIENT FLOORING

- C. Stair treads, risers, and nosings
 - 1. Material: Rubber only (vinyl prohibited)
 - 2. Provide one piece nosing and treads
 - 3. Abrasive edge nosings are prohibited.
- D. Edge, transition, and reducer strips
 - 1. Material: Metal with rubber insert
 - 2. Minimum 1" wide
- E. Adhesive Compounds
 - 1. Cement or adhesive of types recommended by flooring manufacturers to suit material and substrate condition.
 - 2. Use asphaltic type adhesives for concrete substrates.
 - 3. Concrete Slab Primer: Non-staining type as recommended by flooring manufacturer.
 - 4. Leveling Compound: Latex type which can be feather edged, as recommended by flooring manufacturer.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install patterned tile in alternating directions.
- B. Use a 'V' notched trowels. Caulk gun adhesive installation is prohibited.
- C. Installer shall provide a moisture and PH test, one test per each 1,000 square feet of flooring. Record results and locations and provide a written report prior to the start of installation.
- D. Provide ventilation before, during, and after installation to provide a relative humidity of 40%.
- E. Roll floor with a 75 lb. weight same day as installation.
- F. Minimum linear dimension of any section of cove base: 2'-0"
- G. At exposed ends of cove base, cut bottom of exposed toe back at 45 degrees.

3.02 MAINTENANCE MATERIALS

- H. Provide a minimum of 1 box or 2% of the total material, whichever is greater, of same dye lot for each type and color installed.
- A. Provide a minimum of 10 linear feet of each tile accessory for each color used, including stair treads, except provide a minimum of 50 linear feet of cove base.

END OF SECTION 09650

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Interior and exterior exposed surfaces shall be painted except as follows and except as allowed otherwise by the DPS Project Manager.
 - 1. Pre-finished or factory-finished items
 - 2. Ductwork, conduit, hangers, etc. when concealed above finished ceilings or within walls
 - 3. Code-required labels
 - 4. Operating parts such as dampers, sprinkler heads, etc.
 - 5. Galvanized finished metals, except in interior public finished areas

1.02 QUALITY ASSURANCE

- A. Among other standards, follow recommendations of the Architectural Specifications Manual by the Painting & Decorating Contractors of America.
- B. Primers and other undercoat paint shall be produced by the same manufacturer as finish coats.

1.03 SUBMITTALS

- A. Technical specifications for each paint to be used on each substrate
- B. Operation and maintenance information
 - 1. Color finish schedule
 - 2. Color draw-downs
 - 3. Color formula for each color used on the project
 - 4. Paint manufacturer
 - 5. Paint subcontractor
 - 6. Maintenance instructions

PART 2 MATERIALS

2.01 ACCEPTABLE MANUFACTURERS

- A. Paints
 - 1. Devoe
 - 2. Benjamin Moore
 - 3. Sherwin-Williams
 - 4. Kwal Paint
 - 5. Old Western
 - 6. Behr/Kilz
- B. Wood Stain and Wood Finish
 - 1. Benjamin Moore
 - 2. Sherwin-Williams
 - 3. Minwax
 - 4. Devoe
 - 5. Behr/Kilz

SECTION 09900 – PAINTING

- C. Block Filler
 - 1. Devoe
 - 2. Benjamin Moore
 - 3. Sherwin-Williams
 - 4. Kwal Paint
 - 5. Old Western
 - 6. Behr/Kilz
- D. Gypsum board PVA Primer
 - 1. Devoe
 - 2. Benjamin Moore
 - 3. Sherwin-Williams
 - 4. Kwal Paint
 - 5. Old Western
 - 6. Behr/Kilz
- E. Anti-graffiti sealer for masonry
 - 1. American Polymer Corp.
 - 2. ProSoCo, Inc.
 - 3. Tamms Industries Devoe
 - 4. Benjamin Moore
 - 5. Sherwin-Williams
 - 6. Kwal Paint / Comex Group
 - 7. Old Western
 - 8. Behr/Kilz
- F. Marker Board Paint
 - 1. PCI
 - 2. JFB Hart
 - 3. Idea Paint
 - 4. Rustoleum

2.02 PREFERRED PAINT COLORS

- A. PAINT:
 - 1. Select Field and Accent Colors from Approved DPS Recommended Color Palettes
 - a) See Exhibit "A" at end of Section 09900.
 - 2. WALL PAINT (FIELD COLORS):
 - a) Select maximum one (1) field paint color per project.
 - 3. ACCENT PAINT:
 - a) Select maximum three (3) accent paint colors per project.
 - b) Large expanses of accent colored walls and surfaces are not desirable. Accent paints are intended to be used for graphics, striping, or to emphasize architectural elements. One wall of accent paint may be allowed in each room.

SECTION 09900 – PAINTING

B. CEILINGS:

1. Paint: Generally white, except where accent colors are recommended and approved

2.03 MATERIALS

- A. Interior paints on renovations shall be 100% latex acrylic products.
1. All hard ceilings, plaster, drywall, exposed metal decking shall be painted with 100% latex acrylic semi-gloss.
- B. Interior paints on new buildings and expansions shall be as follows:
1. Bathrooms, locker rooms, kitchens, slope closets, and any other wet areas shall be water based epoxy.
 2. Remainder of interior shall be latex semi-gloss 100% acrylic.
- C. All exterior surfaces that receive paint shall be 100% latex acrylic semi-gloss.
- D. Interior and exterior metal door frames, doors, and handrails on new buildings and expansions shall receive DTM water based semi-gloss
- E. Wood doors for renovations shall match the existing doors in the building.
- F. Wood doors for new building and expansions shall be pre-finished with a water borne polyurethane.
- G. Stage flooring paint shall be flat black 100% latex acrylic.
- H. All raw CMU and brick to be painted shall receive block filler prior to paint.
- I. Galvanized metals shall receive a prep primer.
- J. Stains shall have a clear water borne polyurethane finish.
- K. Sheen
1. Interior and exterior painted surfaces shall be finished with a semi-gloss finish.
 2. Sheen for ceiling paints
 - a) Interior ceiling areas shall be painted with semi-gloss sheen on drywall, plaster and exposed metal decking.
 - i) Exception – Hard lid ceilings in Auditoriums shall be painted with flat sheen.
 - b) All acoustic tile to be painted shall be painted with flat latex dryfall.
- L. Material for repainting lockers and metal toilet partitions: Electrostatic finish or industrial enamel

PART 3 EXECUTION

3.01 PREPARATION

- A. General
1. Materials receiving paint, stain, and other liquid-applied finish shall have all grease, dirt and other foreign materials removed.
 2. Patch and fill cracks and holes of all sizes.
 3. Touch up primers, etc.
 4. Fill gaps and transitions at trim, woodwork, cabinets, baseboards, windows, door frames, etc., with sealant or caulk, to provide smooth, uniform surfaces for painting.
 5. Provide a smooth, clean substrate for painting.
- B. Substrate preparation for specific materials
1. Primed steel: Remove rust, touch up shop primer.
 2. Galvanized steel: Chemical phosphate etch, solvent clean.

SECTION 09900 – PAINTING

3. Wood (painted): Fill, sand, seal knots with shellac, putty nail holes.
 4. Wood (stained): Fill and sand.
 5. Gypsum board: Clean and remove dust and dirt.
 6. Acoustic ceilings: Remove and replace damaged acoustic materials.
- C. Repainting of existing painted surfaces
1. Remove tape, staples, and loose paint.
 2. Fill nail holes, staple holes, holes of any size, cracks, and voids.
 3. Fill, sand and finish to provide uniform substrate and to match existing surfaces.
 4. Texture or skim coat if necessary.

3.02 APPLICATION

- A. All surfaces shall receive a minimum of three (3) coats of paint, varnish, etc.
1. Gypsum board and plaster: Primer and two (2) finish coats
 2. Masonry: Filler and two (2) finish coats
 3. Metals: Primer and two (2) finish coats
- B. Paint shall be applied by brush or roller, spraying with back-rolling is allowed (airless, conventional, HVLP).
- C. Allow 24 hours between coats.

3.03 VENTILATION AND SAFETY

- A. Application of alkyd enamel in interior spaces must be performed during non-occupied building hours or; positive ventilation must be provided to assure that fumes from painting operations are exhausted directly to the exterior of the building.
- B. Application of alkyd enamel in interior spaces shall not occur less than 4 hours prior to the scheduled occupancy of the building.

3.04 EXTRA MATERIAL

- A. Draw downs of each color and type used to be included in O&Ms.
- B. Furnish from same production run as materials applied.
- C. Containers shall be clearly labeled describing contents, color, and formula.
- D. Identify using the same designation as found on the finish schedule in the operations and maintenance manual.
- E. One gallon of each color used to be stored at each school where paint color was applied.
- F. Two new boxes of each type of acoustical tile, to be painted by contractor, to match newly painted tile to be stored at each school.

SECTION 09900 – PAINTING

Exhibit "A"

Denver Public Schools Recommended Color Palettes			
Recommended Elementary School Colors		Recommended Middle and High School Colors	
Base Color # 1	Accent Colors for Base Color # 1	Base Color # 1	Accent Colors for Base Color # 1
Miniscule CL2821	Sahara CL2821	Miniscule CL2821	Troller CL2783
	Iron Mountain CL1456		Mariposa CL2614
	Havoc CL2396		Latte CL2655
Base Color # 2	Accent Colors for Base Color # 2	Base Color # 2	Accent Colors for Base Color # 2
Ultra Suede CL1243	Lost Luggage CL2697	Ultra Suede CL1243	Cappuccino CL2696
	Snit CL1866		Regency CL2765
	Sun Stone CLV1129		Flaxen CL2786

See next page for continuation of Color Palettes.

SECTION 09900 – PAINTING

Base Color # 3	Accent Colors for Base Color # 3
Tree Bark CL2911	Baroque CL1855
	Abbot CL2155
	Matka CL1916
Base Color # 4	Accent Colors for Base Color # 4
Lace Falls CLW1046	No Way CLC1205
	Petal Plucker CL3036
	Kitsch CL1826
Base Color # 5	Accent Colors for Base Color # 5
Maligne CLW1027	Green Tea CL1904
	Amarula CL2497
	Chinese Artichoke CL1965
Base Color # 6	Accent Colors for Base Color # 6
Packing Nut CL2881	Wheat Field CL1874
	Marathon CL3125
	Euclid CL1906
Base Color # 7	Accent Colors for Base Color # 7
Salisbury CL2661	Rappinni CL1883
	Amarula CL2497
	Tantric Red CLV1105
Base Color # 8	Accent Colors for Base Color # 8
Wapta CLW1038	October CL1715
	Harlequin CL2327
	Thai-Style CL1707
Base Color # 9	Accent Colors for Base Color # 9
Sheep Skin CLW1029	Woodland Carpet CL1967
	Zentury Brown CL1507
	Outbreak CL1894
Base Color # 10	Accent Colors for Base Color # 10
Windmill CL3021	Your Shorts CL2074
	Mountain Stream CL2143
	Donation CL2156
Base Color # 11	Accent Colors for Base Color # 11
White Shadow #62 Vanilla Bean	Leaf Print CL2826
	Fall Phantom CL2557

Base Color # 3	Accent Colors for Base Color # 3
Tree Bark CL2911	Green Tea CL1904
	Statuesque CL1220
	Rural Life CL1925
Base Color # 4	Accent Colors for Base Color # 4
Lace Falls CLW1046	No Way CLC1205
	Brainchild CL3216
	Shinto CLC1275
Base Color # 5	Accent Colors for Base Color # 5
Maligne CLW1027	Bigspie CLC1217
	Plantain CL3005
	Teasle CL2895
Base Color # 6	Accent Colors for Base Color # 6
Packing Nut CL2881	Wheat Field CL1874
	Anzac CL3085
	Rickshaw CL3275
Base Color # 7	Accent Colors for Base Color # 7
Salisbury CL2661	Mariposa CL2614
	Fall Phantom CL2557
	Bittersweet CL2656
Base Color # 8	Accent Colors for Base Color # 8
Wapta CLW1038	Sandal CLC1248
	Boullion CL3265
	Relic CL2984
Base Color # 9	Accent Colors for Base Color # 9
Sheep Skin CLW1029	Holland CL3032
	Senor CL3034
	Gray Friar CL3134
Base Color # 10	Accent Colors for Base Color # 10
Windmill CL3021	Scribe CL3103
	Bellhop CL3064
	Megaphone CL3055
Base Color # 11	Accent Colors for Base Color # 11
White Shadow #62 Vanilla Bean	Stonehenge CL2624
	Tornado CL3264

SECTION 09900 – PAINTING

Legendary CL1847

Sea Snail CL2546

Note: All Paint colors are selected from Kwal Paint /Comex Group ColorLife paint deck.
9/30/2009

END OF SECTION 09900

SECTION 10260 – WALL AND CORNER GUARDS

PART 1 GENERAL No standards

PART 2 PRODUCTS

2.01 MATERIALS

A. Galvanized sheet steel:

1. Galvanized sheet metal phosphatized for field painting
2. Minimum 18 gauge
3. 'C' style with 2 1/2" x 2 1/2 " legs with beveled edges.
4. Field paint: Prime front of wall surface and back of guard before attachment to wall

B. Stainless steel:

1. Type 304 alloy, minimum 16 gauge
2. Type 430 alloy, factory standard embossed pattern, minimum 16 gauge
3. #4 Satin Finish

C. Fasteners:

1. All fasteners to be non-corrosive and compatible with galvanized steel. All necessary fasteners to be supplied by the manufacturer.
2. All components shall be isolated from dissimilar metals as recommended by the manufacturer and as approved by the architect.
3. Use heavy-duty adhesive on concrete block units.
4. Provide Philips oval head, size 10 screws, or tamperproof screws.

5. **PART 3 EXECUTION**

3.01 INSTALLATION

- A. Screw into drywall every 12 inches O.C. starting 2 inches from the bottom.

END OF SECTION 10260

SECTION 10426 – SIGNAGE AND GRAPHICS

PART 1 GENERAL

1.01 QUALITY ASSURANCE

- A. All signage shall be in strict conformance to local codes, ADA, and signage ordinances.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

- A. Provide signage and graphics as manufactured by one of the following:
 - 2. Signs Now & Division 10 Signage Corp.
 - 3. Best Sign Systems

2.02 FABRICATION

- A. Pre-assemble components in shop as much as possible to minimize field assembly.
- B. Sizes
 - 1. Exterior Signs
 - a) Main building sign shall include school name and Street number in 12" high cast or routed aluminum, all upper case in a high contrast finish to that of the building.
 - b) Traffic signs - size varies, but must match national standard for roadway signage and are painted reflective paint with contrasting symbols or text.
 - 2. Interior signs
 - a). Directional signs - generally 12" x 12" with Tactile and Braille room numbers and raised directional arrows. 1" Helvetica Medium.
 - b). Room Identification Signs - generally 7" wide x 7" high with beveled edges, depending on text information, but not to exceed 9" wide x 7" high.
 - 1). Room number information will be printed in 1 1/2" Helvetica Medium. All letters with room text will be upper case only. Raised Tactile and Braille room numbers, in Photopolymer layout and Braille size is Grade II. Raised lettering shall be one piece integral with the back panel of the sign.
 - 2). Room title will be printed in 1" Helvetica Medium.
 - 3). Where signage already exists, the signage will match the DPS standard or closely resemble the existing signage in color, size and material. Coordinate with DPS Project Manager.
 - c). Room Number Sign - generally shall be 1 1/2" high x 3" wide with square corners.
 - 1). Room Number information will be printed in 1" Helvetica medium font.
 - 2). Room Number text will be upper case only. All letters shall be engraved white letters with black background.
 - 3). Room Number sign shall be placed on upper door frame and centered.
 - d). Restroom Signs - generally 7" wide x 9" high.
 - 1) Tactile Number and Braille Number and 4" Boys/Girls raised symbol Plates. Text will be in 1" Helvetica medium, upper case, with 5" pictorials.

2.03 MATERIALS

- A. Exterior Signs
 - 1. Aluminum

SECTION 10426 – SIGNAGE AND GRAPHICS

- B. Interior Signs
 - 1. Laminated Impact Acrylic- 1/8" thick.
 - 2. Molded Plastic
 - 3. Photopolymer Layout
 - 4. Color will be Pantone "Warm Gray, No 10U".
- 1. Cast Bronze
- D. Vinyl Signs
 - 1. Color will be Pantone "Warm Gray, No 10U".
 - 2. Size of letters will be approved by DPS Project Manager.

2.04 FINISHES

- A. Acrylic/ Molded Plastic
 - 1. Colors as selected from manufacturers standard choices with high contrasting text, with photopolymer layout.
 - 2. Matte, easy to clean, smooth surface.
- B. Aluminum
 - 1. Clear anodized finish for exposed surfaces.
 - 2. Kynar finish in available standard colors.
- C. Graphics- text and designs from available standard colors using one of the following methods:
 - 1. Interior
 - a) Applied vinyl copy- for directional signs only.
 - b) Precision routed copy.
 - c) Routed dimensional copy.
 - d) Cast dimensional.
 - 2. Exterior
 - a) Cast Letters
 - b) Factory applied baked enamel.
 - 3. Plaques
 - a) Dedication Plaque and School Plaque
 - i) Cast bronze
 - ii) Textured background
 - iii) Raised letters w/ polished face (New Times Roman or Old Bookman)
 - b) Concealed mounting
 - c) Bevel border edges.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Installers must coordinate blocking requirements with the contractor.
- B. Mount room signs using both 3M Scotch Brand VHB double stick tape and silicone adhesive at the center of the sign where there are appropriate substrates.
 - 1. In areas of high vandalism provide a bead of latex sealant around the sign perimeter or provide a

SECTION 10426 – SIGNAGE AND GRAPHICS

metal frame which the sign fits into.

C. Mounting locations

2. Internal traffic and street signs: locate as required adjacent to intersections and along no parking lanes, as well as centered in front of ADA parking stalls. (Not in right of way).
3. Directional at opposite wall from elevator exit and at major corridor intersections.
4. Room Identification Signs: Install signs 48" from finished floor on the latch side of the door 2" from frame. This is for all schools K-12.
5. Room Number: mount sign on the head of the doorframe centered above the door.
6. Restroom: same as Room Identification above.
7. Elevator signs: placed outside of each elevator shaft above the shaft doors, on each building floor, same as room number above.
8. In Case of Fire: is to be mounted outside each elevator, on each floor directly adjacent to the elevator call buttons, if it is not engraved onto the call button cover plate.
9. Room capacity: mounted on the wall opposite of and next to the main exit from the room.
10. Stairs/Stairwells:
 - a). Outside the Stairwell: mount on the wall adjacent to the door leading to the stairwell on the latch side.
 - b). Inside the Stairwell: mount on the door, or as required by code.

- D. Mount bronze plaques using concealed fasteners. Mounting locations to be determined by the DPS Project Manger.

3.02 SPARE PARTS

- A. One of each type of sign as a stock sample.

END OF SECTION 10426

SECTION 15010 – BASIC MECHANICAL REQUIREMENTS

PART 1 GENERAL

1.01 INSTALLER QUALIFICATIONS

- A. Plumbing and pipefitting work shall be performed under the direct supervision of licensed plumbers (5-year), with a ratio of not more than two apprentices per journeyman.

1.02 SUBMITTALS

- A. Submit detailed shop drawings for fan systems having structural frame supports for the fan housing.
 - 1. Include solid rotor shaft dimensions, wheel weight, bearing center-to-center distances, bearings, bearing support pedestals and structure, etc.
 - 2. None of the above-cited items shall be considered as being "unavailable" or "proprietary".
 - 3. Relevant sketches giving pertinent details are acceptable.
 - 4. The design resonant speed of the fan system shall be a minimum of 25% above the fan operating speed, considering both wheel mass and inertia.
 - 5. Appropriate engineering calculations must be available to support the design resonant speed value and to insure that the bearing support structure has adequate stiffness in all three directions (lateral, axial, and vertical).
 - 6. The installed, operating fan bearing motions (inboard and outboard) shall not exceed 1.5 mils peak-to-peak in any direction when measured in the "filter out" measurement mode at any operating speed; "filter in" mode measurements are not acceptable.
 - 7. The instrument system used must have a flat response down to 120 RPM.
 - 8. Fan speed shall not exceed 1200 RPM.
 - 9. Design resonant speed is that speed which corresponds to the natural frequency of the spring-mass system consisting of the rotating components, bearing lubrication and housing, and supporting pedestal (supporting floor, foundation, etc., considered to be infinitely rigid).

1.03 OPERATION AND MAINTENANCE INFORMATION

- A. Include the following information, in addition to operation and maintenance information required by Division 1 standards and other Division 15 standards.
- B. Alphabetical list of all system components including the name, address, and 24-hour phone number of the company responsible for servicing each item during the warranty period.
- C. Operating instructions for complete mechanical system, including emergency procedures for fire or failure of major equipment and procedures for normal starting/operating/shutdown and long-term shutdown.
- D. Maintenance instructions including valves, valve tags and other identified equipment lists, proper lubricants and lubricating instructions, and necessary cleaning/replacing/adjusting schedules for each piece of equipment.
- E. Manufacturer's data on each piece of equipment, including:
 - 1. Installation instructions
 - 2. Drawings and specifications (reviewed and accepted shop drawings)
 - 3. Parts lists
 - 4. Complete wiring and temperature control diagrams (reviewed and accepted shop drawings)
- F. In addition to the "Operation and Maintenance Manual", and keyed to it, equipment shall be identified and tagged as specified in Section 15190 - Mechanical Identification including the following:
 - 1. Identify starters, disconnect switches, and manually operated controls, except integral equipment switches with permanently applied, legible markers corresponding to operating

SECTION 15010 – BASIC MECHANICAL REQUIREMENTS

- instructions in the "Operation and Maintenance Manual".
2. Tag manual operating valves with 1-1/2" diameter brass tags attached with chains. Tags shall be sequence numbered with legible metal stamps.
 3. Provide a typed tag list or schedule mounted under glass in the Equipment Room stating number, location, and function of each tagged item. Insert a copy of tag list in each "Operation and Maintenance Manual."

PART 2 EXECUTION

2.01 OWNER INSTRUCTION

- A. Schedule instructional meetings for DPS maintenance personnel on the proper operation and maintenance of all mechanical systems, using the "Operation and Maintenance Manual" as a guide.

END OF SECTION 15010

GENERAL

1.01 REFERENCES

- A. American National Standards Institute (ANSI)
- B. American Society of Mechanical Engineers (ASME)
- C. National Electric Code (NEC)
- D. National Electrical Manufacturer's Association (NEMA)
- E. American Society of Heating Refrigeration and Air Conditioning Engineers (ASHRAE)
- F. American Society for Testing and Materials (ASTM)
- G. National Fire Protection Association (NFPA)
- H. Underwriters Laboratories (UL)

1.02 QUALITY ASSURANCE

- A. Welder Qualifications: Welding shall be performed by ASME Certified Welders with current certificate in accordance with ANSI B31.1 for shop and project site welding of piping work.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Access Doors
 - a. Coordinate standard and fire rated access doors with the Architect.
 - b. 20" by 20" minimum size or larger as required for service use on mechanical equipment
 - c. Locate where required for access to valves, shock absorbers, dampers, controls, mechanical equipment and appurtenances.
 - 1. Where fire rated separations are penetrated by pipes or ductwork, the annular space around the pipe or ductwork shall be caulked with appropriate fire rated material.
- B. Suspension and anchorage
 - a. Use of powder actuated fasteners and toggle bolts are prohibited.
 - b. Steel roof and floor decking, suspended ceilings, and hollow assemblies shall not be used for the attachment of anchorages or supports for suspended equipment, pipes, or other mechanical system components.
 - c. Exception: Attachment, anchorages, or supports specifically approved by a Structural Engineer.
 - d. Equipment shall be anchored with anchors extending through the housekeeping pad or curb into the floor, except where the housekeeping pad is an extension of an inertia block separated from the floor structure.
 - e. Specify use of retaining clips/clamps in locations where vibration may be a concern.
 - f. Drilling, cutting or burning of, or welding to, structural members for attachment of hangers and supports is subject to prior approval by the A/E.
 - g. Wall assemblies are not an acceptable replacement for hangers.

SECTION 15050 – MECHANICAL MATERIALS AND METHODS

- h. Signs shall be secured to a fixed device or the building wall with corrosion-resistant chains or fasteners.
 - i. Pipe hangers shall be tightened with all hangers plumb and tight against the pipe or insulation saddle with all adjustment nuts and lock nuts properly installed.
 - j. If any hangers are found to be out of plumb or not adjusted properly, the Contractor shall be responsible for the cost of removal and reinstallation of the ceiling in order to inspect and correct the hanger installation.
- C. Excavating and Backfilling: Refer to Division 2 standards..
- D. Cutting and Patching: Refer to standard Section 01045 - Cutting and Patching.

END OF SECTION 15050

PART 1 PRODUCTS

1.01 APPROVED MANUFACTURERS

- A. Motors
 - 1. ABB
 - 2. Baldor
 - 3. GE
 - 4. Gould
 - 5. Lincoln
 - 6. Magnetek / Louis Allis
 - 7. Reliance
 - 8. Toshiba
 - 9. TECO-Westinghouse
- B. Variable frequency drives
 - 1. ABB
 - 2. Allen Bradley
 - 3. Baldor
 - 4. GE
 - 5. Magnetek
 - 6. Mitsubishi
 - 7. Robicon
 - 8. Reliance Electric / Rockwell Automation
 - 9. Siemens
 - 10. Square D / Schneider Electric
 - 11. Toshiba

1.02 MOTORS

- A. Ratings
 - 1. Motors shall have standard NEMA service factor of 1.15 at rated voltage, frequency, ambient temperature. Motors shall be suitable for continuous operation through this service factor.
 - 2. 1750 RPM unless otherwise specified for special applications
 - 3. ½ HP and smaller: Single phase
 - 4. ¾ HP and larger: Three phase
 - 5. Motors connected to variable frequency drives shall be suitable for that service and shall be compatible with the specific drive installed.
 - 6. Motors greater than 7 ½ HP shall be inverter duty.
- B. Construction
 - 1. Wiring and windings: Copper
 - 2. NEMA design B totally-enclosed fan-cooled (TEFC)
 - 3. Bearings: Ball type, rated for L-10 life of 20,000 hours.
 - 4. Bearing housings: Double shielded

SECTION 15170 – MOTORS, STARTERS & DRIVES

- 5. Insulation: NEMA Class F
- 6. Derate motors for an altitude of 5400 feet not utilizing service factor
- C. Power factor (5HP and larger): Labeled power factor, at nameplate rating and rated voltage, shall be minimum 95% or furnish power factor correction components correcting to minimum 95%.
- D. Energy efficiency: Motors 1-1/2 HP and larger: Premium efficiency type with minimum nominal efficiency per IEEE Test Procedure 112A, Method B.
- E. Starting capability: Select motors capable of making starts as frequently as indicated by the automatic control system requirements for energy conservation or other multiple starts.
- F. Acoustical: Motors shall not exceed 80 dB rating at 3 feet when running full speed and power range.
- G. Belt drive motors: 5 HP or larger shall have dual push-pull adjustment screws for motor mounts. Retrofits require motor mounts be replaced if not of this type.

1.03 MOTOR STARTERS

- A. Provide magnetic motor starters for all motors that are interlocked with external pilot duty devices, and for all 3 phase motors. Magnetic motor starters and overload protection shall be size coordinated with the driven equipment.
- B. Refer to standard Section 16480 – Motor Control for additional motor starter standards.
- C. Motor Control Center (MCC): Where large groups of starters can be centrally located, furnish a motor control center (MCC) to be specified by Division 16 and coordinated with Division 15 for motor and control requirements. Refer to Section 16480 – Motor Control for MCC requirements.

1.04 VARIABLE FREQUENCY DRIVES (VFD)

- A. VFDs shall convert constant frequency three phase AC line voltage to variable frequency, variable voltage AC output suitable for control of standard NEMA design B induction motor.
- B. Ratings
 - 1. Minimum VFD efficiency: 97% at 100% speed and 100% torque
 - 2. Rated input power: [460] [208] volts \pm 10%, 3 phase, 60 Hz \pm 5%
 - 3. Rated output power: 0 to [460] [208] volts (\pm 1%), 3 phase, 0 to 60 Hz (field adjustable to 90 Hz or 120 Hz)
 - 4. Output frequency stabilizer: \pm 0.25% of maximum frequency
 - 5. Ambient temperature range: 0 to 40°C
 - 6. Elevation: De-rate for elevation of 5400 feet
 - 7. Power unit rating basis: 100% rated current continuous
 - 8. Displacement power factor: Minimum 98% over entire speed range
 - 9. Overload capacity: 110% for one minute at 40°C
 - 10. Speed range: 10:1
- C. Construction
 - 1. Full-wave bridge converter to convert incoming fixed voltage/frequency to controlled DC voltage
 - 2. DC bus filter and chopper circuit to maintain minimum displacement power factor of 0.98 over entire speed range
 - 3. Inverter section to change controlled DC voltage to six-step adjustable voltage/frequency output, generated by power transistors controlled by six identical base driver circuits. VFD shall not induce excessive power losses in motor. Worst case RMS motor line current measured at rated speed, torque, voltage shall not exceed 1.05 times rated RMS motor current for pure sine-wave operation

SECTION 15170 – MOTORS, STARTERS & DRIVES

4. UL listed, factory wired and mounted in NEMA 1 wall mounted enclosures requiring front access only.
 - a) Door of each power unit shall include power on light, VFD fault light, VFD run light, stop pushbutton, start pushbutton, fault reset pushbutton, hand-off-auto selector switch, manual speed control potentiometer

D. Basic features

1. Control

- a) With H-O-A switch in hand, driver shall be controlled by manual speed potentiometer on drive door
- b) With H-O-A switch in automatic, drive shall be started and stopped and speed controlled by external control signals provided by others. Speed control switch shall be verified with temperature control installer
- c) With H-O-A switch in off setting, run circuit shall be open and VFD shall not operate.

2. Field adjustments

- a) Inverse-time overcurrent trip: 50% to 110%
- b) Minimum speed: 0% to 100%
- c) Maximum speed: 0% to 100%
- d) Volts/Hertz: 3.7 to 8.6 V/Hz.
- e) Independent acceleration/deceleration rates: 0.5 to 120 seconds. Regenerative or dynamic braking shall not be required for deceleration
- f) Voltage boost: 0 to 20 volts
- g) Maximum frequency: 60, 90, 120 Hz

3. Protective features and circuits

- a) Input line fuses
- b) Input line noise suppression with line reactor, metal oxide varistor (MOVs), and snubber circuits
- c) Instantaneous overcurrent and inverse time overcurrent protection
- d) Individual transistor overcurrent protection
- e) Input undervoltage (-15%) trip
- f) Three cycle power ride-through capability
- g) Missing phase or blown fuse protection
- h) Chopper circuit overcurrent protection
- i) Chopper power supply failure
- j) Thermal overload trip
- k) Precharge failure
- l) Ground fault protection on start-up
- m) Output line-to-line short circuit protection

4. Arrange VFD to provide automatic restart after trip condition from overcurrent, overvoltage, undervoltage, overtemperature. Drive shall shut down and require manual reset and restart if automatic reset/restart function is not successful within maximum five attempts.

SECTION 15170 – MOTORS, STARTERS & DRIVES

5. VFD shall have ability to start into motor that is spinning in forward direction and resume normal operation upon auto-restart of drive.
 6. VFD shall incorporate energy saver circuit which shall improve motor efficiency at reduced speeds.
- E. Diagnostic features and fault handling
1. The following conditions shall cause safe drive shutdown:
 - a) Loss of input power
 - b) Undervoltage
 - c) Sustained gradual overload
 - d) Instantaneous severe overload
 - e) Power transistor overtemperature
 - f) Blown fuse
 - g) Logic power supply failure
 2. VFD shall have internal digital display indicating following trip condition as aid in troubleshooting. Faults:
 - a) Excess start time
 - b) Power supply or low line
 - c) Blown fuse or missing phase
 - d) Ground fault
 - e) Instantaneous overcurrent
 - f) Inverse time overcurrent
 - g) Overtemperature
 - h) Provide SPDT contacts for external trip indication
- F. Metering, features and enclosure
1. Special features shall be factory mounted and wired within VFD enclosures unless otherwise specified
 2. The AC drive power converter shall be enclosed in a Type 1, Type 12K, or Type 3R enclosure with a circuit breaker disconnect, industrial rated operator controls, user terminal strip connections and bypass controls (if required).
 3. Input circuit breaker: Panel mounted and interlocked with enclosure door, with through-the-door handle to provide positive disconnect of incoming AC power, rated for minimum 14,000 AIC
 4. Door mounted meters
 - a) Ammeter (0% - 100%)
 - b) Speed/frequency meter (0% - 100% speed/Hz)
 - c) Voltmeter (0-600 VAC)
 - d) KW Meter (0-110%)
 - e) 5-digit elapsed time meter
 5. Constant speed bypass: Transfer from VFD to line shall be by manual selector switch.
 - a) Bypass circuitry: Enclosed in separate NEMA 1 cabinet, bolted to bottom of VFD enclosure, with main disconnect switch or circuit breaker interlocked with bypass compartment door (in addition to VFD compartment disconnect)

SECTION 15170 – MOTORS, STARTERS & DRIVES

6. Bypass cabinet shall include VFD output contactor, full-voltage starting contactor (both contactors electrically interlocked), thermal overload relay to provide motor protection and control power transformer. Mount bypass selector switch, motor fault light, power [IS SOMETHING MISSING HERE?] light, motor on VFD light, motor on-line light on cabinet door.
 7. Provide speed profile whereby individual field adjustment settings for start, stop, entry, exit, slope, minimum and maximum speed points can be set to respond to input speed signal.
 8. Mount input line reactor within VFD enclosure to limit total harmonic distortion (THD) on input lines to 3% per IEEE-519.
 9. Include critical speed avoidance circuit for selection of critical speed with rejection band centered on that speed. Drive shall ignore any speed signals requiring drive operation within rejection band
- G. Integrated Building Automation System (IBAS): Coordinate controls standards with the DPS Project Manager and the DPS Controls Application Engineer.

PART 2 EXECUTION

2.01 TESTING AND BALANCING

- A. Together with driven load, test VFD and demonstrate proper operation of all functions and diagnostics.

2.02 OWNER INSTRUCTION

- A. Provide instruction (4 hours) to Owner's maintenance representatives on operation and trouble shooting of VFDs.

END OF SECTION 15170

PART 1 GENERAL

1.01 REFERENCES

- A. American National Standards Institute (ANSI)
 - 1. ANSI A13.1: Scheme for the Identification of Piping Systems
 - 2. ANSI Z53.1: Safety Color Code for Marking Physical Hazards.
- B. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)

PART 2 PRODUCTS

2.01 IDENTIFICATION MATERIALS FOR PIPING AND EQUIPMENT

- A. Metal tags
 - 1. Round brass discs, minimum 1-½" diameter, with edges ground smooth
 - 2. Each tag punched and provided with brass chain for installation.
- B. Engraved nameplates
 - 1. Laminated three-layer plastic with engraved black letters on light contrasting background color
- C. Pressure sensitive markers: Brady Type 350 flexible vinyl film identification markers and tape, with legend, size and color-coding per ANSI A13.1.
- D. Semi-rigid plastic identification pipe markers: Seton Setmark with legend, size and color-coding per ANSI A13.1. Direction-of-flow arrows are to be included on each marker, unless otherwise specified.
 - 1. Diameters ¾" through 5": Setmark Type SNA markers
 - 2. Diameters 6" or larger: Setmark Type STR markers

PART 3 EXECUTION

3.01 IDENTIFICATION OF PIPING AND EQUIPMENT

- A. General
 - 1. Provide pipe identification, valve tags, stencils, or engraved nameplates to clearly identify the mechanical equipment, piping and controls of the various mechanical systems and direction of flow in piping
- B. Methods for identification
 - 1. Metal tags
 - a) Stamp tags with letter prefixes to indicate service, followed by a number for location in system.
 - 2. Engraved nameplates
 - a) Attach nameplates with brass screws.
 - b) Pressure-sensitive embossed labels are not acceptable.
 - c) Nameplates shall bear the same identifying legend used on the Contract Documents.
 - 3. Pressure-sensitive markers
 - a) Apply pressure-sensitive markers with complete wrap-around.
 - b) Test marker adhesion for permanence.
 - c) Markers showing dogears, bubbles, or other failings shall be replaced.
 - d) Place markers at all branches and at a maximum of 25' on center.
 - 4. Semi-rigid plastic identification markers

SECTION 15190 – MECHANICAL IDENTIFICATION

- a) Seton Setmark pre-molded (not pressure-sensitive) identification markers may be used at Contractor's option on service piping which is accessible for maintenance operations (but not on piping in finished spaces).
- b) This type of marker shall not be installed on bare pipe when surface temperature exceeds 180°F unless a 1" thick insulation band is first provided under marker for protection from the hot pipe

C. Controls

- 1. Magnetic starters and relays shall have engraved nameplates to identify connecting or controlled equipment.
- 2. Manual operating switches, fused disconnect switches and thermal overload switches which have not been specified as furnished with indexed faceplates shall also have nameplates or be stenciled as to "connected" or "controlled" equipment.
- 3. Automatic controls, control panels, zone valves, pressure electric, electric pressure switches, relays, and starters shall be clearly identified.

D. Fans

- 1. Supply and exhaust fans, air handling units, and connecting ductwork supplying one or more areas from an equipment room or isolated crawl or furred space shall have nameplate or be stenciled as to plan code number, service and areas of zones served.

E. Motors controlled by energy management system

- 1. The District may furnish the following self-adhering signs which the Contractor shall install as indicated:

CAUTION

**THIS EQUIPMENT IS
UNDER COMPUTER
CONTROL AND MAY
CYCLE AT ANY TIME.
BEFORE WORKING ON IT,
DISCONNECT THE
ELECTRICAL POWER
AND CONTACT THE
DISTRICT SERVICE
DESK AT 720-423-4020.**

END OF SECTION 15190

PART 1 PART 1 - GENERAL

1.01 SUBMITTALS

- A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:
 - 1. Certified fan performance curves with system operating conditions indicated.
 - 2. Certified fan sound-power ratings.
 - 3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
 - 4. Material gauges and finishes, including color charts.
 - 5. Dampers, including housings, linkages, and operators.
- B. Coordination Drawings: show fan room layout and relationships between components and adjacent structural and mechanical elements. Show support locations, type of support, and weight on each support. Indicate and certify field measurements.
- C. Maintenance Data: for centrifugal fans to include in maintenance manuals specified in Division 1.
- D. Quality Assurance Data:
 - 1. Electrical Components, Devices, and Accessories: listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
 - 2. NEMA Compliance: motors and electrical accessories shall comply with NEMA standards
 - 3. AMCA Compliance: products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.
 - 4. Manufacturer's Qualifications: firms regularly engaged in manufacture of specified fans with characteristics, sizes, and capacities required, whose specified fan has been in satisfactory use in similar service for not less than 3 years.
 - 5. Codes and Standards: comply with the following:
 - a) AMCA Compliance: provide fans which have been tested and rated in accordance with AMCA standards, and bear AMCA Certified Ratings Seal.
 - b) NEMA Compliance: provide motors and electrical accessories complying with NEMA standards.
 - c) UL Compliance: provide power ventilators which are designed, manufactured, and tested in accordance with UL 705 "Power Ventilators".
- E. Project Record Documents:
 - 1. Shop Drawings: detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - a) Wiring Diagrams: power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.
 - b) Design Calculations: calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
 - c) Vibration Isolation Base Details: detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, and base weights.

SECTION 15850 – EXHAUST FANS

- d) Wiring and termination drawings.
- F. Operation and Maintenance Data:
 - 1. Operating and maintenance procedures.
 - 2. Complete set of manufacturer's drawings.
 - 3. Complete documentation of inspections and tests performed, including any logs, curves, and certificates. Documentation shall note any replacement of equipment or components that failed during testing.
 - 4. Spare parts lists.
 - 5. Data sheets updated to reflect field installation conditions.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

D. POWER ROOF VENTILATORS

- 1. Acme
- 2. Carnes
- 3. Cook
- 4. Greenheck
- 5. Jenn-Air
- 6. Penn

2.02 UTILITY SET FANS

- A. Description: belt-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, and accessories.
- B. Housing: fabricated of galvanized steel with side sheets fastened with a deep lock seam or welded to scroll sheets.
 - 1. Housing Discharge Arrangement: adjustable to eight standard positions.
- C. Fan Shaft: turned, ground, and polished steel; keyed to wheel hub.
- D. Shaft Bearings: prelubricated and sealed, self-aligning, pillow-block-type ball bearings with ABMA 9, L₅₀ of 200,000 hours.
- E. Belt Drives: factory mounted, with final alignment and belt adjustment made after installation.
 - 1. Service Factor Based on Fan Motor: 1.5
 - 2. Motor Pulleys: adjustable pitch for use with motors through 5 hp; fixed pitch for use with motors larger than 5 hp. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.
 - 3. Belts: oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.
 - 4. Belt Guards: fabricate of steel for motors mounted on outside of fan cabinet.

2.03 CENTRIFUGAL ROOF VENTILATORS

- A. Description: belt-driven or direct-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, curb base, and accessories.
- B. Housing: removable, spun-aluminum, dome top and outlet baffle or extruded-aluminum, rectangular top; square, one-piece, aluminum base with venturi inlet cone.
- C. Fan Wheels: aluminum hub and wheel with backward-inclined blades.
- D. Belt-Driven Drive Assembly: resiliently mounted to housing, with the following features:

SECTION 15850 – EXHAUST FANS

1. Fan Shaft: turned, ground, and polished steel; keyed to wheel hub.
 2. Shaft Bearings: permanently lubricated, permanently sealed, self-aligning ball bearings.
 3. Pulleys: cast-iron, adjustable-pitch motor pulley.
 4. Fan and motor isolated from exhaust airstream.
- E. Accessories:
1. Bird Screens: removable, 1/2-inch mesh, aluminum or brass wire.
 2. Dampers: counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.
 3. Motorized Dampers: parallel-blade dampers mounted in curb base with electric actuator; wired to close when fan stops.
- F. Roof Curbs: galvanized steel; mitered and welded corners; 1-1/2-inch-thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to suit roof opening and fan base.
1. Overall Height: 12 inches.

2.08 MOTORS

- A. Comply with requirements in Specification Section 15170 Motors and Drives.
- B. Enclosure Type: guarded dripproof.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install power ventilators level and plumb.
- C. Install floor-mounting units on concrete bases. Concrete, reinforcement, and formwork requirements are specified in Division 3 Section Cast-in-Place Concrete.
- F. Install units with clearances for service and maintenance.
- G. Label units according to requirements specified in Specification Section 15190 Mechanical Identification.
- H. All roof mounted fans and equipment need to comply with Section 07720 Roof Curbs

END OF SECTION 15850

SECTION 15900 – DUCTWORK AND ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes
 - 1. Ductwork
 - 14. Flexible duct fan connections

1.02 QUALITY ASSURANCE

- A. All ductwork shall be in accordance with NFPA 90A and NFPA 90B. All kitchen exhaust duct shall be in accordance with NFFPA96 and local building code.

1.03 SUBMITTALS

- A. Product Data:
 - 1. Ductwork material.
 - 2. Product data sheets for dampers, access doors, flexible duct, hardware, and sealants.
- B. Quality Assurance Data:
 - 1. Ductwork shop drawings indicating fabrication and installation details for metal ducts shall include the following:
 - a) Duct layout indicating size and pressure class.
 - b) Duct accessories such as dampers, louvers, access doors, and air devices.
 - c) Indicate duct length, fittings, hangers and supports, and seals.
 - 2. Coordination drawings shall include the following. Coordination drawings may be combined with ductwork shop drawings.
 - a) Provide reflected ceiling plans, drawn to scale, which indicate the location of ceiling mounted diffusers, grilles, registers, lights, and other ceiling mounted devices or architectural ceiling treatments.
- C. Project Record Documents:
 - 1. Ductwork shop drawings and coordination drawings.

PART 2 PRODUCTS

2.01 MATERIALS

- A. General: all duct materials shall be non-combustible or conforming to requirements for Class 0 or Class 1 air duct materials, as per UL 181 with limitations as noted in NFPA 90A.
- B. Steel Ducts: ASTM A525 or ASTM A527 galvanized steel sheet, lock-forming quality, having zinc coating of 1.25 oz. per sq. ft. for each side in conformance with ASTM A90.
- F. Sealant: non-hardening, non-asbestos, water resistant, UL classified as fire resistive, compatible with mating materials.

2.12 FLEXIBLE DUCT FAN CONNECTIONS

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards, and as indicated.
- B. UL-listed fire-resistant neoprene-coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz. per sq. yd. crimped into metal edging strip.

PART 3 EXECUTION

3.01 INSTALLATION

- B. All ductwork shall be installed per the most recent SMACNA and ASHRAE Guidelines for duct installation and support except as modified herein.

SECTION 15900 – DUCTWORK AND ACCESSORIES

- F. Volume Control Dampers shall be set and permanently marked or painted to indicate the damper position in the final, balanced air volume condition.
- G. All open ends of ducts shall be covered at end of day to protect against dust, water, etc.

END OF SECTION 15900

PART 1 GENERAL

1.01 HEALTH AND SAFETY

- A. Safety Standards: cleaning contractors shall comply with all applicable federal, state and local requirements for protecting the safety of the contractors' employees, building occupants, and the environment. In particular, all applicable standards of the Occupational Safety and Health Administration (OSHA) shall be followed when working in accordance with this specification.
- B. Occupant Safety: no processes or materials shall be employed in such a manner that they will introduce additional hazards into occupied spaces.
- C. Disposal of Debris: all Debris removed from the HVAC System shall be disposed of in accordance with applicable federal, state and local requirements.

1.02 QUALIFICATION OF THE HVAC SYSTEM CLEANING CONTRACTOR

- A. Membership: the HVAC system cleaning contractor shall be a certified member of the National Air Duct Cleaners Association (NADCA), or shall maintain membership in a nationally recognized non-profit industry organization dedicated to the cleaning of HVAC systems.
- B. Certification: the HVAC system cleaning contractor shall have a minimum of one (1) Air System Cleaning Specialist (ASCS) certified by NADCA on a full time basis, or shall have staff certified by a nationally recognized certification program and organization dedicated to the cleaning of HVAC systems.
- C. Supervisor Qualifications: a person certified as an ASCS by NADCA, or maintaining an equivalent certification by a nationally recognized program and organization, shall be responsible for the total work herein specified.
- D. Experience: the HVAC system cleaning contractor shall submit records of experience in the field of HVAC system cleaning as requested by the Owner. Bids shall only be considered from firms which are regularly engaged in HVAC system maintenance with an emphasis on HVAC system cleaning and decontamination.
- E. Equipment, Materials and Labor: the HVAC system cleaning contractor shall possess and furnish all necessary equipment, materials and labor to adequately perform the specified services.
 - 1. The contractor shall assure that its employees have received safety equipment training, medical surveillance programs, individual health protection measures, and manufacturer's product and material safety data sheets (MSDS) as required for the work by the U. S. Occupational Safety and Health Administration, and as described by this specification.
 - 2. The contractor shall maintain a copy of all current MSDS documentation and safety certifications at the site at all times, as well as comply with all other site documentation requirements of applicable OSHA programs and this specification.
 - 3. Contractor shall submit to the Owner all Material Safety Data Sheets (MSDS) for all chemical products proposed to be used in the cleaning process.

1.03 ACCEPTABLE SUPPLIERS

- A. Ductworks
- B. Monster Vac

PART 2 HVAC SYSTEM CLEANING SPECIFICATIONS AND REQUIREMENTS

2.01 SCOPE OF WORK:

- A. Scope: this section defines the minimum requirements necessary to render HVAC components clean.
- B. The Contractor: shall be responsible for the removal of visible surface contaminants and deposits from within the HVAC system in strict accordance with these specifications.
- C. The HVAC system: includes any interior surface of the facility's air distribution system for conditioned spaces and/or occupied zones. This includes the entire heating, air-conditioning and ventilation system from the points where the air enters the system to the points where the air is discharged from the system. The return air grilles, return air ducts (except ceiling plenums and mechanical room) to the air handling unit (AHU), the interior surfaces of the AHU, mixing box, coil compartment, condensate drain pans, humidifiers and dehumidifiers, supply air ducts, fans, fan housing, fan blades, air wash systems, spray eliminators, turning vanes, filters, filter housings, reheat coils, and supply diffusers are all considered part of the HVAC system.

2.02 IN SUMMARY THE CONTRACTOR SHALL CLEAN

- A. The full length of all supply air ducts
- B. The full length of all return air ducts
- C. The full length of all outside air ducts
- D. All supply and return air registers and diffusers
- E. All vertical shafts
- F. All air handlers including coils, blowers, filter racks, drain pans, and the entire interior of the air handler

PART 3 EXECUTION

3.01 General HVAC System Cleaning Requirements

- A. Containment: debris removed during cleaning shall be collected and precautions must be taken to ensure that Debris is not otherwise dispersed outside the HVAC system during the cleaning process.
- B. Particulate Collection: where the Particulate Collection Equipment is exhausting inside the building, HEPA filtration with 99.97% collection efficiency for 0.3-micron size (or greater) particles shall be used. When the Particulate Collection Equipment is exhausting outside the building, Mechanical Cleaning operations shall be undertaken only with Particulate Collection Equipment in place, including adequate filtration to contain Debris removed from the HVAC system. When the Particulate Collection Equipment is exhausting outside the building, precautions shall be taken to locate the equipment down wind and away from all air intakes and other points of entry into the building.
- C. Controlling Odors: all reasonable measures shall be taken to control offensive odors and/or mist vapors during the cleaning process.
- D. Component Cleaning: cleaning methods shall be employed such that all HVAC system components must be Visibly Clean. Upon completion, all components must be returned to those settings recorded just prior to cleaning operations.

- E. **Air-Volume Control Devices:** dampers and any air-directional mechanical devices inside the HVAC system must have their position marked prior to cleaning and, upon completion, must be restored to their marked position.
- F. **Service Openings:** the contractor shall utilize service openings, as required for proper cleaning, at various points of the HVAC system for physical and mechanical entry, and inspection.
 - 1. Contractor shall utilize the existing service openings already installed in the HVAC system where possible.
 - 2. Other openings shall be created where needed and they must be created so they can be sealed in accordance with industry codes and standards.
 - 3. Closures must not significantly hinder, restrict, or alter the air-flow within the system.
 - 4. Closures must be properly insulated to prevent heat loss/gain or condensation on surfaces within the system.
 - 5. Openings must not compromise the structural integrity of the system.
 - 6. Construction techniques used in the creation of openings should conform to requirements of applicable building and fire codes, and applicable NFPA, AMACNA and NADCA Standards.
 - 7. Cutting service openings into flexible duct is not permitted. Flexible duct shall be disconnected at the ends as needed for proper cleaning and inspection.
 - 8. Rigid fiber glass duct board duct systems shall be resealed in accordance with NAIMA recommended practices. Only closure techniques which comply with UL Standard 181 or UL Standard 181a are suitable for fiber glass duct system closures.
 - 9. All service openings capable of being re-opened for future inspection or remediation shall be clearly marked and shall have their location reported to the Owner in project report documents.
- G. **Ceiling sections (tile):** The contractor may remove and reinstall ceiling sections to gain access to HVAC systems during the cleaning process.
- H. **Air distribution devices (registers, grilles & diffusers):** The contractor shall clean all air distribution devices.
- I. **Air handling units, terminal units (VAV, Dual duct boxes, etc.), blowers and fans:** The contractor shall insure that supply and return fans and blowers are thoroughly cleaned. Areas to be cleaned include blowers, fan housings, plenums (except ceiling supply and return plenums), scrolls, blades, or vanes, shafts, baffles, dampers and drive assemblies. All visible surface contamination deposits shall be removed. Contractor shall:
 - 1. Clean all air handling unit (AHU) internal surfaces, components and condensate collectors and drains.
 - 2. Assure that a suitable operative drainage system is in place prior to beginning wash down procedures.
 - 3. Clean all coils and related components, including evaporator fins.
- J. **Duct Systems: Contractor Shall:**
 - 1. Create service openings in the system as necessary in order to accommodate cleaning of otherwise inaccessible areas.

2. Mechanically clean all duct systems to remove all visible contaminants, such that the systems are capable of passing Cleaning Verification Testing.

3.02 MECHANICAL CLEANING METHODOLOGY

- A. Source Removal Cleaning Methods:** The HVAC system shall be cleaned using Source Removal mechanical cleaning methods designed to extract contaminants from within the HVAC system and safely remove contaminants from the facility. It is the contractor's responsibility to select Source Removal methods which will render the HVAC system Visibly Clean and capable of passing cleaning verification methods. No cleaning method, or combination of methods, shall be used which could potentially damage components of the HVAC system or negatively alter the integrity of the system.
1. All methods used shall incorporate the use of vacuum collection devices that are operated continuously during cleaning. A vacuum device shall be connected to the downstream end of the section being cleaned through a predetermined opening. The vacuum collection device must be of sufficient power to render all areas being cleaned under negative pressure, such that containment of debris and the protection of the indoor environment are assured.
 2. All vacuum devices exhausting air inside the building shall be equipped with HEPA filters (minimum efficiency), including hand-held vacuums and wet-vacuums.
 3. All vacuum devices exhausting air outside the facility shall be equipped with Particulate Collection including adequate filtration to contain Debris removed from the HVAC system. Such devices shall exhaust in a manner that will not allow contaminants to re-enter the facility. Release of debris outdoors must not violate any outdoor environmental standard, codes or regulations.
 4. All methods require mechanical agitation devices to dislodge debris adhered to interior HVAC system surfaces, such that debris may be safely conveyed to vacuum collection devices. Acceptable methods will include those which will not potentially damage the integrity of the ductwork, nor damage porous surface materials such as liners inside the ductwork or system components.
- B. Methods of Cleaning Fibrous Glass Insulated Components:**
1. Fibrous glass thermal or acoustical insulation elements present in any equipment or ductwork shall be thoroughly cleaned with HEPA vacuuming equipment, while the HVAC system is under constant negative pressure, and not permitted to get wet in accordance with applicable NADCA and NAIMA standards and recommendations.
 2. Cleaning methods used shall not cause damage to fibrous glass components and will render the system capable of passing Cleaning Verification Tests.
- C. Damaged Fibrous Glass Material:**
1. If there is any evidence of damage, deterioration, delaminating, friable material, mold or fungus growth, or moisture such that fibrous glass materials cannot be restored by cleaning or resurfacing with an acceptable insulation repair coating, they shall be identified for replacement.
 2. When requested or specified, Contractor must be capable of remediating exposed damaged insulation in air handlers and/or ductwork requiring replacement.

3. Replacement Material: In the event fiber glass materials must be replaced, all materials shall conform to applicable industry codes and standards, including those of UL and SMACNA.
4. Replacement of damaged insulation is **NOT** covered by this specification.

D. Cleaning of coils

1. Any cleaning method may be used which will render the Coil Visible Clean. The drain for the condensate drain pan shall be operational. Cleaning methods shall not cause any appreciable damage to, displacement of, inhibit heat transfer, or erosion of the coil surface or fins, and shall conform to coil manufacturer recommendations when available. Coils shall be thoroughly rinsed with clean water to remove any latent residues.

E. Biocidal Agents and Coatings

1. Biocidal agents shall only be applied if active fungal growth is reasonably suspected, or where unacceptable levels of fungal contamination have been verified through testing.
2. Application of any biocide agent used to control the growth of fungal or bacteriological contaminants shall be performed after the removal of surface deposits and debris.
3. Only biocide agents registered by the U.S. Environmental Protection Agency (EPA) shall be used.
4. Biocidal agents shall be applied in strict accordance with manufacturer's instructions.
5. Biocidal coating products for both porous and non-porous surfaces shall be EPA registered water soluble solutions with supporting efficacy data and MSDS records.
6. Biocidal coatings shall be applied according to manufacturer's instructions. Coatings shall be sprayed directly onto interior ductwork surfaces, rather than "fogged" downstream onto surfaces. A continuous film must be achieved on the surface to be treated by the coating application. Application of any Biocidal coatings shall be in strict accordance with manufacturer's minimum surface application rate standards for effectiveness.
7. Inspection of Work Performed.

- F. Contractor is to leave open all cleaning access points until they have been inspected by a representative of Denver Public School. The contractor can call for an inspection at any time.
- G. Only after each opening has been inspected can the contractor seal up the cleaning access points.
- H. The interior of the supply, return and outside air ducts must be visibly clean and pass inspection in order to satisfactorily complete the contract.
- I. All air handlers need to be inspected before the access panels and doors are closed. All components of the air handlers must pass inspection in order to satisfactorily complete the project.

END OF SECTION 15911

PART 1 GENERAL

1.01 SUMMARY

- A. Provide all labor, materials, equipment and services necessary for a complete Direct Digital Control (DDC) System comprised of various types of Direct Digital Control (DDC) controllers, conventional electric/electronic controls, and equipment-mounted controls, as indicated. The system shall include all software and hardware for all specified capabilities.
- B. All BAS points and data (i.e., setpoints, operating parameters, etc.) shall be enabled for reading and/or writing via BACnet communications to allow for the IBAS monitoring, scheduling, alarming and trending functions

1.02 COORDINATION

- A. Electrical power wiring control shall be performed by the Electrical Contractor. Coordinate locations of circuits with the electrical design.
- C. All automatic temperature control dampers and airflow stations shall be provided by the Controls Contractor for installation by the Mechanical Contractor under the Control Contractor's supervision, unless they are components of packaged equipment.
- D. Adjustments of manual balancing devices, as required to obtain design air and/or water flows, shall be by the Balancing Contractor. The Controls Contractor shall provide assistance to the Balancing Contractor with control adjustments as required to obtain design flows.
- E. Controls Contractor shall provide the necessary software for use with the Balancer's personal computer for interfacing with their control equipment. Where proprietary equipment/gateways are required, this equipment shall be provided for the Balancing Contractor's use.
- F. The General Contractor shall:
 - a) Provide on existing work all necessary cutting, patching and painting.
 - b) Provide access doors or other means of access through ceilings and wall for service to control equipment.
- G. DPS Department of Technology Services will make any and all connections to the DPS intranet. DPS Department of Technology Services will assign an IP address to each IP-communicating controls device.

1.03 SUBMITTAL DATA AND SHOP DRAWINGS

- A. Specify that all shop drawings, I/O schedules, point lists, system schematics, and product data shall be submitted for approval per Division 1, Section 01300.
- B. Submittal data and shop drawings shall conform to the following requirements:
 - 1. All shop drawings shall be prepared according to the requirements in the most current version of Division 00050 of the DPS Construction Standards. Some of the requirements in this document are listed below.
 - a) Shop drawings shall be developed using the most current version of AutoCAD (AutoDesk, Inc.) or a version that is 100 percent compatible with the current version. VISIO drawings are not acceptable.
 - b) Specific information shall be added to the title block of each sheet to aid in the DPS archiving/retrieval process for construction documentation.
 - 2. All final or as-built shop drawings for temperature control will become permanent record documents and shall be prepared on 11"x17".
 - 3. All submittal data shall be bound or in a three-ring binder as appropriate. All the information shall be indexed and tabbed with reference to the specific section of the specifications. All options, ranges, and voltages (which will be provided) shall be clearly indicated on each product data sheet.

4. The format for submittal information shall be as follows:
 - a) Control drawings and building plans shall be CAD-prepared drawings. Drawings that cannot represent the total information on one drawing (i.e., a building plan) shall be noted with appropriate match lines, cross references, and key plans.
 - b) The control drawing package shall consist of:
 - i) A title sheet listing the project title, index of all the control drawings, and a network schematic showing all DDC panels and network connections on the project. The network diagram shall indicate all communication devices. The following information shall be provided for each network device:
 - Location (room number).
 - Power source (breaker panel I.D. and breaker number).
 - Panel software name and serial number.
 - Type of controller: the network diagram shall depict the actual connection sequence of the devices, including distances between devices, type of wire used and serial number of controller.
 - ii) The second drawing in the control package shall consist of typical installation details, a valve schedule, and a damper schedule. The valve schedule shall have entries for: valve tag, system served, quantity type (3w, 2w), GPM, actual CV, actual pressure drop, size, close-off rating, spring range, part number, and manufacturer. The damper schedule shall have entries for: damper tag, system served, quantity, type (PB, OB), CFM, size, actual pressure drop, quantity of actuators, spring range, damper model number, and actuator model number.
 - iii) Subsequent drawings shall depict complete systems (air handler, chiller, boiler, etc.). The drawing shall show the system schematic, all wiring of the DDC controller, all wiring of field devices, starters, and connections to equipment. Each drawing shall have a bill of materials and a sequence of operation.
 - iv) Floor plans shall depict equipment location, sensor, and panel locations. The duct and space static pressure monitor points shall be shown.
- C. Submittal data and control drawings for all equipment and systems shall be submitted (per Section 01300) to the Architect/Engineer for review prior to ordering or fabrication of the equipment. The following information shall be included in these submittals:
 1. Thirty (30) days or less after notice to proceed:
 - a) Control valve and damper schedules that include:
 - i) Size.
 - ii) Cv (valves).
 - iii) Close off pressure rating (at 0 psi for N.C., two-way valves; at 20 psi for N.O., two-way valves; and at 0 psi between ports A and B for three-way valves).
 - iv) Gpm or cfm.
 - v) Spring range of the actuator.
 - vi) Quantity of actuators (dampers).
 - vii) Actual pressure drop for each item.
 - b) Technical specification data sheets of each system component and device, which includes all data needed to show compliance with this document.
 2. Sixty (60) days or less after notice to proceed:
 - a) Control drawings with detailed piping and wiring diagrams; system schematics with controlled/monitored device locations; and connections to all enclosures, panels, and

controllers, including a bill of material for all systems.

- b) Sequence of operation for all controlled and monitored points for each system. Sequence shall be on same drawing as that for the corresponding system schematic.
 - c) A complete input/output schedule for each DDC panel and dedicated controller, including point name (the same name to be used in software), functional description of each point, point type, complete wiring diagram for each point from controller to input or output device, field device type, and location, etc.
 - d) Communications cable schematic showing panel and controller locations, controller power source, and all interconnecting data and communication conductors. Arrange the panels in the order in which they will actually be interconnected in the field.
 - e) On control drawings show sensor, panel, and equipment locations by referring to room number.
 - f) DDC network configuration, complete with interconnection diagrams for all peripheral devices, batteries, power supplies, etc.
 - g) A bill of material shall be shown on each drawing. The bill of material shall include the device code used on the controls drawings, description of the product, name of the manufacturer, complete model number, measurement range (if applicable), and quantity.
 - h) Identify the electrical power source for each DDC panel by location (room number), panel designation, and breaker number. Include the identification on the drawing and at the DDC panel itself.
 - i) Submittals shall also include a complete test plan and procedures. Test plan shall be coordinated with the Testing, Adjusting, and Balancing Contractor per Section 15990. The test plan shall delineate the methods of testing and recording the results of the point-by-point verification and calibration of the hardware and the testing and tuning of the software. The test plan shall include a listing of all hardware points with columns for calibration, test and certification. There shall be a similar record for software.
3. Fourteen (14) days prior to system demonstration and acceptance testing:
- a) Provide software programs and sequences written in the program language and in English.

1.04 PROJECT RECORD DOCUMENTS

- A. Specify that, upon completion of the installation, a complete set of record (as-built) drawings shall be provided. The content and format of the drawings shall be as described previously.
- B. Prior to final completion of the installation, prepare complete Operation and Maintenance (O&M) manuals. Refer to Division 1, Section 01300, and Division 15, Section 15050, for requirements. Also provide one set of electronic media containing all CAD-prepared.
 1. Temperature control diagrams, including an explanation of the control sequence of each system along with the following instruction wherever applicable.
 - a) Emergency procedures for fire or failure of major equipment.
 - b) Normal starting, operating and shutdown procedures.
 - c) Summer or winter shutdown procedures.
 2. The temperature control diagrams are to be wall-mounted in an aluminum frame with plastic laminate glass in a location approved by the DPS Controls Application Engineer, preferably in the main mechanical equipment or fan room where the main control panel is located.
 3. A reduced copy of the controller drawing, listing all input and output points with functional descriptions, shall be placed inside the door to each controller enclosure in a plastic pocket attached to the door. The sheet shall be laminated. One sheet is required for each controller housed in the enclosure. Control System Programmer's Manual with complete description of the custom control language and associated editor, including sample-written programs. Provide complete sets of all Programmer's Manuals. All software and firmware algorithms shall be completely described and documented.

4. Provide maintenance, installation, and engineering manual(s) that clearly explain how to debug hardware problems; how to repair or replace hardware; preventive maintenance guidelines and schedules; calibration procedures; and how to engineer and install new points, panels, and operator interfaces.
5. All CAD drawings and controller dumps, generated for operation of the system, shall be included as part of the system documentation. This information shall be submitted in a machine-readable format (i.e., floppy disk).
6. Input/output schedules, data sheets, and all other items required. Describe all regular maintenance that will need to be performed on the DDC hardware. Provide list of recommended spare parts. List all replacement parts with part numbers.
7. Complete original-issue documentation, installation, operation manuals, and supporting software for all third-party hardware and software furnished and installed as part of the system or required for the operation of the system, including remote terminals, user's computer work station, monitors, graphics and memory boards, network servers, printers, and modems.
8. A diagram of the wiring layout for the communication network showing the room number of the location of all junction boxes shall be shown on the diagram. Distances between termination points shall be indicated with a description of routing.

1.05 DEMONSTRATION AND TRAINING

- A. This Contractor shall provide at least 4 hours in one session of classroom training at times and location as directed by the Owner. The training shall focus on design, operation, and maintenance procedures of the products installed and shall cover:
 1. Hardware configuration, including PC boards, switches, communication and point wiring, and location of all sensors and control devices.
 2. Hardware maintenance, calibration, troubleshooting, diagnostics, and repair instructions.
 3. Operation of central work station, including logging on and off, interrogating the system, producing reports, acknowledging alarms, overriding computer control, changing firmware and software parameters, and generating and linking graphic screens.
 4. The operational sequence of each system, including normal and abnormal operating modes, operating control strategies, and operator actions required to reset or monitor the system.
 5. Programming using the editor, program design, syntax, and loading of custom control software.
 6. Recovery procedures from power failures.
 7. Alarm formats.
 8. Maintaining software and programming backups.
- B. The instructor(s) for the above sessions shall be employee(s) of the Control Contractor whose primary function is customer training and applications support.
- C. A minimum of two copies of the most current control drawings shall be provided to the DPS HVAC Shop before the training begins. These shall be in addition to the drawings to be provided under Part 1 Shop Drawing requirements, if the O&M Manuals have not been turned in to the Architect before the time of the training.
- D. The training may be phased. The Owner may elect to conduct training and demonstration in two- to four-hour sessions over the life of the warranty period. All instructional material shall be available to each employee at each training session up to a maximum of ten (10) individuals.
- E. All demonstration and training sessions shall be coordinated with the DPS Controls Application Engineer.

1.06 WARRANTY

- A. The warranty period shall begin as authorized by the DPS Controls Application Engineer in writing. Authorization will not be given before the following conditions are met. Under no conditions will the Controls Warranty begin before the starting date of the General Warranty for the overall project.

1. Completion of the tests and demonstration required in Part 3 and correction of all problems discovered during the testing process.
 2. Completion of all punch list items that are the direct responsibility of the Controls Contractor.
 3. Conduction of a preliminary training session for personnel of the HVAC Shop of the District. The training shall consist of an orientation session at the job site to familiarize personnel with the location and type of controlled equipment and controls on the project, a discussion of the control sequences, and a review of the control drawings. A copy of the most current control drawings shall be provided to the DPS HVAC Shop at this time as well. Other, more detailed, training sessions (such as for review of the control programs) may be held at a later date during the warranty period
 4. Completion and distribution of the as-built control drawings, including correction of all items noted by the Owner and Engineer after review of the documents.
- B. The control system shall be guaranteed to be free from original defects in material and workmanship and in software design and operation for a period of 24 months after completion of the contract. The Contractor shall provide the necessary skills, labor, and parts to assure that all system and component failures are promptly repaired.
- C. The Contractor shall receive calls during the warranty period for all problems or questions experienced in the operation of the installed equipment and shall take steps to correct any deficiencies that may exist. The response time to critical problems (critical problems are those that may shut down or disrupt the operation of the school or create potential damage to the building or equipment) shall be four (4) hours maximum.
- D. During the warranty period, the Contractor shall maintain a backup of all software installed in the system. The backup shall be updated monthly or whenever the Contractor makes a change to the software. A reload of backup software into the system shall be performed by the Contractor immediately upon notification by the Owner. The reload shall be free of charge unless it is due to a power failure of a duration longer than the battery backup.
- E. The Contractor shall optimize all control software to assure acceptable operating and space conditions and peak energy efficiency. This shall include changes needed to optimize operation of the systems even if not explicitly described in Control Strategies.
- F. The Contractor shall include the extended warranty for upgrades of controllers installed in the building for the warranty period.
- G. At the end of the warranty period, the Contractor shall supply updated copies of the latest versions of all project record documentation as described in the Part 1 Project Record Documents requirements. This includes final updated drawings, software documentation, and magnetic media backups that include all changes that have been made to the system during the warranty period.
- H. Coordinate with DPS Controls Application Engineer in advance before connecting new DDC system to District network.
- I. Once the building DDC system is connected to the network, the Contractor shall notify the DPS Controls Application Engineer before and after performing any work on the DDC components, and report any changes made.
- J. During the warranty period, District personnel shall make a reasonable effort to determine if a problem is due to the control system or some other source not the responsibility of the Controls Contractor, before requesting warranty service. However, if the Controls Contractor is called out and determines that the problem is not due to the controls system or other building components, the Contractor shall not charge the District for a service call if it is determined that the source of the problem is not his responsibility.

1.07 OWNERSHIP OF PROPRIETARY MATERIAL

- A. All project developed hardware and software shall become the property of the Owner. These include but are not limited to:
1. Project graphic images.

2. Record drawings.
3. Project database.
4. Job-specific application programming code.
5. All other documentation.

PART 2 PRODUCTS

2.02 AUTOMATIC DAMPERS

- A. All dampers not specified with equipment in other sections of the specifications shall be furnished by the Temperature Control Contractor and shall be single or multiple blade type as required.
- B. All damper frames are to be constructed of #13 Gauge G90 galvanized sheet metal, roll formed into channels and welded for maximum strength and shall have flanges for duct mounting.
- C. All blades shall be fabricated from single #16 gauge G90 galvanized sheet metal. Blade pins shall be steel, zinc plated, and chromate treated to provide no-slip pivoting when a damper is used as a single module, or is interconnected with others. Blades shall be suitable for high velocity performance.
- D. Dampers used for outside, return, or exhaust air, and those used for zone mixing dampers shall be provided with seals to provide tight shut off along all edges of all blades; tight closing and low leakage damper of less than 4.5 cfm/ft. at 1" static pressure. Bearings shall be oil impregnated to provide constant lubrication.
- E. Blade edge seals and top and bottom channel seals shall be easily replaced if they are damaged.
- F. An internal stop shall be provided on all dampers to prevent over-rotation in the closed position.
- G. Ruskin CD-50, Johnson DCO/DCP, NCA SCD-LL-57 or approved equal.

2.03 LOCAL CONTROL PANELS

- A. NEMS-1 locking panels shall house DDC controllers transformers, power supplies, communications interfaces, transducers/sensors that do not need to be field mounted, relays, wire termination/junction strips, etc.,.
- B. Devices shall be flush-mounted on panel face.
- C. Manual timer overrides are not permitted. Manual overrides will be handled through a software function. If any manual override exist they shall be removed as part of this project.
- D. Internal components shall be securely mounted on removable sub-panels. Each component shall be individually labeled with function and device identification, as shown on control/interlock shop drawings. Label all components in accordance with Specification Section 16195 Electrical Identification.
- E. Interconnections between internal and face-mounted devices pre-wired with color-coded stranded conductors neatly installed in plastic troughs and/or tie-wrapped. Terminals for field connections shall be UL-listed for 600-volt service, individually identified per control/interlock drawings, with adequate clearance for field wiring. Control terminations for field connection shall be individually identified per control drawings.
- F. Provide on/off power switch with over-current protection and a 1-1/2" main air gauge for control pressure sources to each local panel. Provide a 120-volt duplex outlet inside each control panel that houses a DDC controller (except VAV controllers) if there is not an outlet within 5' of the enclosure.
- G. All control panel locks shall be the same. Contractor shall give the keys to the DPS Controls Application Engineer at completion of training.
- H. All field devices shall be mounted in panels. Exceptions include devices with enclosed electrical terminations, and designed to be installed on the controlled/monitored equipment and (e.g., pipe/duct temperature/pressure sensors) or those for space mounting (e.g., space temperature sensors).

2.05 SENSOR/TRANSMITTERS

- A. Transmitters shall have direct-acting, linear 0-5vdc or 4-20madc output signal compatible with

controller, with full-scale accuracy of ± 1 percent or better. Zero and span shall be field-adjustable.

- C. Water flow sensors should be in-line or insertion turbines, vortex, or magmeter types.
- D. Fan status shall be by current switch.

2.06 ELECTRIC AUXILIARY DEVICES

- A. Fan status shall be by current switch.
- B. Use damper end switches that are integral to the actuator.
- C. Control relays shall include a "energized" indication light.
- D. Time-delay relays shall be adjustable plus or minus 200 percent (minimum) from the required setpoint.

2.07 ELECTRIC ACTUATORS

- A. Damper actuators shall be selected by the Controls Contractor per manufacturer's recommendations to provide sufficient close-off force to effectively seal damper. Furnish a separate actuator for each damper section.
- B. All actuators shall provide a means of manually positioning the output coupling in the absence of power.
- C. Dual independently adjustable auxiliary switches must be integral to the actuator. The addition of this feature as an accessory kit is not acceptable.
- D. All actuators shall provide an easily readable high contrast yellow on black position indicator.

2.08 SAFETY CONTROLS

- A. Freezestats: Provide one freezestat for each coil section of each coil bank (e.g., one coil with three sections requires three freezestats). Wire freezestats to protect unit in both hand and automatic operation. Wire one set of contacts directly to the fan starter circuit and the other to an alarm input. The device shall be manually reset unless indicated otherwise.
- B. Duct Smoke Detectors: specified to be furnished under Division 16 and mounted by this Contractor.
 - 1. This Contractor shall be responsible for all smoke detector interlock wiring to HVAC equipment.
 - 2. Wire smoke detectors to shut down the equipment in 'hand' and 'automatic' mode.

2.09 OPERATOR INTERFACE

- A. Operator Interface Software (A/E may not specify this if previously provided) – The software shall provide the following functions:
 - 1. Graphic Screens - Display of custom graphic screens with dynamic point information and the ability to show animation by shifting image properties based on the status of the point.
 - a) NOTE - The terms "graphic screens" and "graphic(s)" in this specification refers to graphical images viewed via a PC running Operator Interface Software (a "Thick Client") or a PC viewing graphical images on web pages via a web browser (a "Thin Client").
 - b) Graphic Generation: Graphic files shall be created with the use of a graphics generation package furnished with the system. The graphics generation package shall also provide the capability of capturing or converting graphics from other programs such as AutoCAD.
 - c) Graphics Library: Furnish a library of standard HVAC system/equipment graphics screens such as chillers, boilers, air handlers, terminals, fan coils, unit ventilators, etc.; and standard symbols for HVAC components including fans, pumps, coils,

valves, piping, dampers, ductwork, etc.

2. System Applications - Provide the following:
 - a) System Database Save and Restore: Automatic (when changes occur) or manual backup of the system databases (e.g., a DDC Panel point database and/or control program). The operator shall also be able to manually initiate a download of a specified database to any DDC Device in the BAS.
 - b) System Configuration: Provide an application for DDC System configuration (DDC Device communications addressing, point definition, etc.).
 - c) Help: Provide a context sensitive, help system to assist the operator in operation of the DDC System.
 - d) Security: Each operator shall be required to log on to the DDC System with a user name and password in order to view, edit, add, or delete data. System security shall be selectable for each operator.
 - e) System Diagnostics: The system shall automatically monitor the operation of all DDC Devices including network communications and provide an alarm when a failure occurs.
 - f) Standard DDC System Operating Features:
 - (1) Point/Data Overrides/Modifications – Output points and system data (i.e., setpoints) shall be modifiable (i.e., auto vs. manual and overridden value) via a link to each item's graphic screen image.
 - (2) Alarm Processing – An alarm log with acknowledgement and alarm clearing functions; and the ability to configure alarm limits, and system reactions (e.g., an alarm message, communications method, etc.).
 - (3) Trend Logs: The ability to define a custom historical trend log for any data in the system. The data can be displayed tabular or graphical.
 - (4) Scheduling: A graphical method for scheduling equipment operation including normal, holiday and exception scheduling.
3. Control Software Editors: The software shall allow for Operator editing of all control applications including:
 - a) Application Specific Controller: A full screen graphical editor for each type of application that allows the operator to view and change the configuration, name, control parameters, and set points for all controllers.
 - b) Custom Control Programming: A graphical editor for creating, modifying, and debugging the custom control programming for all Routers/Panels/Controllers.
4. Web Server: This shall, as a minimum, allow Thin Clients (PC's running web browser software) to perform all the capabilities described above except: Graphic Generation, System Database and Restore, System Configuration, and Control Software Editors.

2.10 DDC CONTROLLER REQUIREMENTS

A. General:

1. A separate DDC controller for each AHU or other HVAC system/equipment shall be supplied.
2. No more than one DDC controller shall be provided for each AHU or other HVAC system. Provide point expansion modules to meet this requirement. Certain systems (e.g., chiller plants) may be best served by multiple controllers – it is the A/E's responsibility to make this determination and to clarify this issue in the design.
3. Equipment Controls and Subsystem Interfaces:
 - a) Provide interfaces to equipment controls that are to be integrated to the DDC System.

- 1) No hardware interface is required for equipment controls that communicate via BACnet/IP. However, provide sufficient DDC System capacity for mapping all BACnet/IP points/data into the DDC system.
- b) Provide interfaces to Subsystems that do not communicate via BACnet/IP.
- c) “Interfaces” shall include standard/optional modules and for DDC Controllers (i.e., an MS/TP interface or Modbus gateway) are provided by separate DDC system devices (i.e., routers/gateways).
- d) See the remainder of this design, and equipment controls and Subsystem specifications for more information.

2.11 GENERAL PURPOSE APPLICATION CONTROLLERS

- A. General Purpose Multiple Application controllers shall be B-BC or B-AAC BTL-listed for BACnet communications. JCI N1 or N2 protocol communications may be acceptable in certain retrofit situations – consult with DPS about this issue.
- B. At least one B-BC controller with BACnet/IP communications shall be provided. This controller (a JCI NAE or NCE) need not be provided with integral point termination capabilities. Larger projects (.e.g., High Schools) may benefit from more than one of these controllers – consult with DPS Controls Application Engineer about this issue. Other controllers shall use the MS/TP data link technology.
- C. Point Expansion: The General Purpose Multiple Application Controllers shall use point expansion modules to meet the design’s point requirements.
- D. Point Programming: All point data, algorithms and application software within a controller shall be custom programmable from the operator workstation. Controllers with factory-programmed control sequences (e.g., for a typical AHU or other system) shall not be acceptable.
- E. Each output point shall have an integral manual override switch that allows the output to be configured in one of three states: on, off, or automatic operation. An LED shall indicate the state of each output.

PART 3 EXECUTION

3.01 CONTROL WIRING

- A. Provide all control and communication wiring (except CAT 6 for Ethernet/IP) including that for connecting equipment controls and Subsystems to the DDC System.
- B. The Cat 6 wiring drops that interconnect the DDC System Controllers, equipment controls, and Subsystems, and the devices to the IBAS shall be installed by the telecom contractor. The installer shall be Panduit certified as outlined in Section 17700, paragraph 1.05 Contractor Qualifications. Construction contractor needs to coordinate timing of wiring installation to facilitate the installation and testing of the IBAS system.
 1. Final wiring from the DDC System Controllers, equipment controls, and Subsystems to the drops shall be provided by the Controls Contractor.
- C. Control wiring shall be concealed except in equipment rooms.
- D. Electrical installation will be according to the following requirements:
 1. All wire and cable runs will be protected with metallic conduit or cable trays. Exceptions are as follows:
 - a) NEC Class 2 low voltage wiring where not exposed to view such as above suspended ceilings, in shafts, etc., may be run in cable tray or properly secured to the building (when approved by code authority).
 - b) Wiring enclosed in temperature control panels.
- E. All wire and cable runs will be labeled or otherwise coded at both ends, the labeling or coding scheme should be well- organized, consistent, and documented (submitted).
- F. All low voltage instrumentation wiring shall be minimum 18 AWG stranded copper for sensors and

communication. All low voltage cables in ceilings shall be UL listed for air plenum service and suspended neatly from the overhead structure. Do not lay on top of ceiling tiles.

- H. Low-voltage (24V or less) AC or DC wiring shall not be run in conduit containing 120 VAC wiring.
- I. Label all temperature control wiring junction box covers with an adhesive backed water-proof flexible mylar label with the letters T/C, using an orange background with black letters to differentiate them from junction boxes installed by the electrical and fire alarm contractor. The labels shall be 3" x 3".
- J. Use proper size wire nut type connectors on all sensor wiring with factory recommended twisting. Crimp connectors are not allowed on sensor wiring.

3.02 INSTALLATION AND SETUP REQUIREMENTS

- A. For all applications utilizing outside air, relief, isolation or exhaust dampers: install an E/P to automatically close the dampers when its associated air-handling unit or fan is turned off. The E/P shall be wired so the damper is closed when the fan or AHU is turned off with the starter switch in the OFF or AUTO position (or in either the BYPASS or VFD modes when a variable-frequency drive is used). The dampers shall open, or return to automatic control, as required, when the fan or AHU is turned on, whether the started switch is in the HAND or AUTO position (or in either the BYPASS or VFD modes when a variable-frequency drive is used).
- B. The name of each point shall conform to the District's standard protocol used at DPS. The intent is to utilize standard point names within a project and from one project to another. Consult DPS Controls Application Engineer for current standards.
- C. Utilize programming protocol used by JCI at DPS whenever possible.

3.03 CONTROL DEVICE LOCATIONS

- A. Outdoor temperature or RH sensors shall be located on the design drawings, and generally on a northern exposure, in a shaded location, preferably in a place where there is a continuous stream of outside air over the sensor, unless shown otherwise. Consult with the DPS Controls Application Engineer to determine the preferred locations.
- B. Provide wind-dampening "weatherhead" with insect screen on outdoor atmospheric pressure-sensing point and mount at least 3' above the highest roof structure to minimize false readings due to wind direction and/or eddies.
- C. Remote control devices not in local panels shall be accessible for adjustment and service, below 6' above finished floor whenever possible.

3.04 CONTROL PANELS

- A. Electro-pneumatic switches (EPs) and relays shall be grouped together and installed in a single, central panel located next to the enclosure housing the associated controller. At the Contractor's option, the relays and EPs may be installed in the same enclosure as the controller. Remote-mounted relays and EPs are not acceptable. Remote-mounted PE switches are allowed.
- B. Electrical power for each panel shall be from a dedicated circuit. Where available in a building, utilize emergency power circuits for all controls. It is the A/E's responsibility to show a sufficient number of dedicated controls circuits in locations where control power will be needed on the electrical drawings. For retrofit applications, where connecting to existing control-power wiring, it is the Contractor's responsibility to verify that the power source is from a dedicated circuit.

3.05 IDENTIFICATION

- A. All control equipment shall be clearly identified by control shop drawing designation code and a functional description as follows:
 - 2. Other remote control devices and sensors (located both within and outside of control panels): metal tags, plastic laminate labels, or (on non-porous surfaces only) adhesive backed labels (i.e., from a laser printer or a dedicated label-making device). Do not attach tag or label to removable covers, adjacent surface etc.,

3. Control panels: Engraved plastic laminate labels. Indicate panel number and systems served.
4. All wiring, including wiring within factory-fabricated panels, shall be labeled within 2" of each termination with DDC point number/controller number or other descriptive information.
5. Plenum-rated cabling shall use different jacket colors to differentiate between the following:
 - a) Input point wiring.
 - b) Output point wiring.
 - c) Communications (i.e., MS/TP).
 - d) Low Voltage power.
6. All metal and plastic engraved labels shall be secured with chains, nylon tie-wraps, or rivets. Permanent adhesive is acceptable only when mechanical fasteners would damage the labeled equipment.
7. All switches, relays, and panel components shall be labeled. Relay bases shall be labeled, not the removable relay cube.
8. Labels shall not be mounted on removable surfaces, such as cable tray covers.

3.06 OPERATOR INTERFACE AND OTHER SYSTEM CONFIGURATION

A. General

1. All DDC System schedules, alarms and trends for this project shall be set up under this section (i.e., for communication to the IBAS).
2. Alarms and trends shall also be communicated to the DDC System's local Operator Interface until the IBAS or warranty period is complete.
3. Schedules shall also be available for modification from the local Operator Interface until the IBAS or warranty period is complete.
4. Consult with the DPS Controls Application Engineer to determine when the local Operator Interface functionality is no longer needed and disable any DDC System communications to the Operator Interface.

B. Graphics – Provide that specified by the A/E for use during system start-up, testing, commissioning and the warranty period (in addition to that provided by the IBAS).

C. Alarms

1. Size DDC System controllers so that 48 hours of alarm information minimum can be stored at the building (not including any Operator Interface archiving capacity).
2. Set up alarms so that:
 - a. They are not issued when the associated system is off (e.g., an alarm for an AHU supply air temperature shall not be issued when the AHU is off).
 - b. The alarm limits vary with the associated operating mode (e.g., a space temperature's alarm limits changes between occupied and unoccupied modes).
 - c. The alarm limits vary with the associated set-point (e.g., an AHU supply air or space temperature's alarm limits vary with the set-point if reset).
 - d. Consult with the DPS Controls Application Engineer to determine the appropriate alarm limits.
3. The following data (and/or BACnet properties or service primitives) shall be associated with each alarm generated/stored by the DDC System:
 - a. Time and date of the alarm.

- b. Alarm Priority
 - c. Event (alarm) type
 - d. The BACnet “From” and “To” states
 - e. The BACnet “Event Values” (e.g., alarm limit)
 - f. A text description of the alarm condition including:
 - 1) Location (building, floor, zone, office number, etc.).
 - 2) Equipment (air handler #, pump, etc.).
 - g. Initiating device and object identifier
 - h. Acknowledgement time and date
 - i. Operator who issued acknowledgement.
4. Alarms shall be generated by the DDC System upon the occurrence of one of the following events (in addition to the specified in the Sequence of Operation):
- a. Failure of a controller or any other DDC System hardware components.
 - b. Failure of communications between DDC System components; and between the DDC System and the IBAS, equipment controllers or Subsystems.
 - c. A monitored status indicating a discrepancy between the actual and the required value.
 - d. A monitored value does not meet criteria established by the operator.
 - e. The deviation of a variable from set-point exceeds operator-established criteria.
 - f. The output to a final control element is outside operator-established criteria.
 - g. A digital input is in the state defined by the operator as indicating an alarm condition.
 - h. Software failures and errors shall be diagnosed and annunciated by the BAS.
- D. Trending
- 1. Size DDC System controllers so that 72 hours of trend information minimum can be stored at the building (not including any Operator Interface archiving capacity).
 - 2. Set up trends in each associated General Purpose Controller for all points using change-of-value (COV) trending – consult with the DPS Controls Application Engineer to select the appropriate COV thresholds for analog points/data:
 - a. All Temperature sensors
 - b. All Pressure inputs excluding those used to sense flow
 - c. All Humidity sensors
 - d. All Gas concentration inputs
 - e. All Current or Voltage inputs
 - f. All Flow inputs
 - g. Digital input status points
 - h. All Analog outputs
 - i. Data (virtual points) used for operator override software switches (e.g., for changing operating status of systems and/or used for switching system modes of operation)
 - 3. Set up trends for each of the following Zone Controller, if applicable, using change-of-value

(COV) trending:

- a. Space, Supply air and Coil Return Water Temperature
 - b. Space/Zone Pressure
 - c. Space or Exhaust Humidity
 - d. Fan and Heat Pump Status
 - e. Air Flow
 - f. All Digital input status points
 - g. All Occupancy status input points
 - h. All Analog output points
- E. Point/Data Naming – Use the convention jointly developed with the DPS Controls Application Engineer and IBAS Contractor. See the Part 1 Submittals requirements in 15975.
- F. IP Addresses - Addressing shall be set up per the direction of the DPS Controls Application Engineer.
- G. BACnet Communications Addressing/Numbering – Consult with the DPS Controls Application Engineer to determine the address/number ranges to be used on this project and the standard for assigning specific addresses/numbers to each of the project's networks and devices.
- H. BACnet Broadcast Management Configuration – Only one controller for this project shall be configured as a BBMD (BACnet Broadcast Management Device).

3.07 IBAS COORDINATION

- A. The Contractor shall configure the DDC System in preparation for integration with the IBAS as follows:
1. Data Access: The following DDC System data shall be available for communication with the IBAS (e.g., discoverable without need for any configuration or programming efforts of the DDC System by the IBAS contractor):
 - a. All input/output points from the DDC System, equipment controllers or
 - 1) All points from Subsystems that do not communicate via BACnet/IP shall also be available.
 - b. Set-points and other sequence of operation parameters as defined in Sequence of Operation and the following:
 - 1) Lead/lag sequence variables
 - 2) Temperature set-points and reset limits
 - 3) System switches
 - 4) PID tuning parameters
 - 5) Alarm limits
 - 6) Heating/cooling switchover set-points
 - c. All start/stop schedules within the DDC System (including those associated with an optimum start and/or stop routine)
 - d. All alarms set up within the DDC System
 - e. All historical data trended by the DDC System
 2. The DDC System shall accept time synchronization messages from the IBAS and update all controller time clocks in the system accordingly. Coordinate with the IBAS contractor to ensure that the time synchronization message(s) from the Niagara Supervisor works properly to perform this function.

3. The IBAS shall be used to view and modify DDC System schedules using BACnet Schedule/Calendar Objects.
4. Alarms
 - a. The DDC System shall communicate alarms to the IBAS (i.e., using BACnet Alarm and Event Services).
 - b. Alarm priority – Coordinate with the IBAS contractor concerning the specific alarm priority values to be used.
 - c. Any alarms that cannot be supported by BACnet Intrinsic Reporting (i.e., an alarm determined by the alarmed object's alarm properties) or BACnet Algorithmic Change Reporting (i.e., one of the standard alarm/event algorithms defined in the standard) shall require additional alarm configuration efforts under this section. These efforts include configuring/programming the algorithm, defining a BACnet object which is used to communicate the alarm status and coordination of these alarm objects with the IBAS contractor.
5. Historical Data Trending
 - a. The DDC System controllers shall communicate trend data to the IBAS every 48hrs or when the trend log has reached capacity (whichever is sooner).
 - b. Trend data shall be communicated to the IBAS using BACnet Trend Log objects.
6. Point/Data Operator Override - Any manual operator actions described by the sequences shall be available from the IBAS.
7. Point/Data Override Priorities – Coordinate with the IBAS contractor to ensure that commandable points/data (e.g., a BACnet Binary Output object) are written to at the correct priority level by the IBAS.

3.08 TESTING AND DEMONSTRATION

- A. Prior to substantial completion, the control system shall undergo a series of tests to verify and demonstrate operation and compliance with this document. These tests and demonstrations shall occur after the Contractor has completed the installation, started up the system, and performed his own performance tests.
- B. The tests and demonstrations described in this section are to be performed in addition to the tests that the Contractor performs as a necessary part of the installation, startup, and debugging process. Control system testing and demonstration shall be scheduled with the DPS Controls Application Engineer.
- C. The Contractor shall provide at least two men equipped with two-way communication, and shall demonstrate actual field operation of each control and sensing point for all modes of operation, including day, night, summer, winter, occupied, unoccupied, fire/smoke alarm, and power failure modes. The purpose is to test and demonstrate the setup, calibration, response, and action of every point. Any test equipment required to prove the proper operation shall be provided by and operated by the Contractor. The DPS Controls Application Engineer, and District's HVAC representative shall observe and review these tests.
 1. The system software shall be complete such that each control loop shall function as specified in the Sequence of Operation. This Subcontractor shall be required to furnish the software program and test the operation of every control loop.
 2. After all field connections have been made and control power is available in the control panel, the DPS Controls Application Engineer shall be notified and the control system shall be energized. Any required reloading of the software shall be performed and demonstration of the mechanical system, automatic temperature control system, and other connected systems shall commence.
 3. This Subcontractor shall be responsible for all necessary revisions to the software as required to provide a complete and workable system consistent with the letter and intent of the specification.

Control performance criteria is specified in the sequence of operations shown on the drawings and/or the specifications.

- D. Operational logs for each system which indicate all setpoints, operating points, valve/damper positions, mode, and equipment status shall be submitted to the Architect/Engineer. These logs shall cover a 24-hour period and have a sample frequency of not more than 10 minutes. The logs shall be provided in printed and disk formats.
- E. Control loops shall maintain setpoint within the following tolerances:
 - 1. Air pressure ± 0.5 " w.g. range 0 to 6" w.g.
 ± 0.01 " w.g. range -0.1 to 0.1" w.g.
 - 2. Airflow ± 100 cfm.
 - 3. Temperature $\pm 1.0^{\circ}\text{F}$.
 - 4. Humidity ± 5 percent relative humidity.
- 6. Control loops that do not meet the above tolerances shall be re-tuned.
- F. This Contractor shall demonstrate HVAC alarms prior to placing ventilation systems in service.
- G. Participate in all tests required between the DDC System and the IBAS. Provide a protocol analyzer (i.e., Wireshark) for use in the testing. See 15975 for more information.
- H. The control systems will not be accepted as meeting the Requirements of Completion until all tests and demonstrations described in this section have been performed to the satisfaction of the DPS Controls Application Engineer.
- I. After the system has operated properly for 90 days following startup of the final component of the heating and air conditioning systems, as-built copies of the software on electronic media and a printed copy shall be submitted to the Owner for permanent record purposes. Any software upgrading or enhancements to improve the system operation or as required for proper operation of the system during the first 24 months of operation is the responsibility of this Subcontractor. When changes are made to the software, the Contractor shall immediately provide updated copies of the files on floppy disks.

3.09 CONTROL EXECUTION – GENERAL

- A. Provide independently adjustable, minimum ON and OFF timers for each start/stop point. Initially set bvtimes so as not to exceed six (6) starts per hour. On two-speed motors, provide a 20-second adjustable time delay when transferring from high-speed to low-speed, to allow the load to decelerate. This software time delay is in addition to the hardware time delay in the starters.
- B. All setpoints, operating points, sequencing ratios, PID tuning parameters, and all other numeric and digital constants shall be adjustable by the user (with a high-level password) from the graphic. To change these values, the user shall not be required to modify program code, recompile, or download.
- C. System logs, trend logs, and event-initiated logs shall be set up to provide historical and real-time monitoring of system operation. Logs shall be grouped by equipment.
- D. Safety Shutdowns - General: all safety shutdowns of electrical equipment shall be hardwired. All shutdowns shall occur directly through interconnection of contacts on the safety device with the controlling circuit of the electrical equipment. Safety shutdowns through software are not acceptable. Interposing relays may be used only with prior approval of the DPS Controls Application Engineer when no alternative exists.
- E. The Contractor shall notify the DPS Controls Application Engineer one month in advance of substantial completion so that the the IBAS (15975) can be scheduled.

3.10 BAS SOFTWARE

- A. Provide sufficient internal memory for the specified control sequences and logging. There shall be a minimum of 25 percent of available memory free for future use.

3.11 IBAS REQUIREMENTS

- A. See 15975 for Contactor requirements concerning the interface of the BAS system to the IBAS.
- B. The point/data list at the end of 15985, the drawings, or other specification sections includes points (and associated field devices) that shall be incorporated into the BAS design as part of this section.
- C. Any points and data listed which are not controlled by the 15950 system (e.g., lighting) shall be provided by input/output point interfaces to the 15950 system if this information is not available by digital communications (e.g., BACnet).
- D. See 15985 and/or the drawings for the sequences of operation to be implemented by the system.

END OF SECTION

SECTION 15975 – INTEGRATED BUILDING AUTOMATION SYSTEM (IBAS)

PART 1 GENERAL

1.01 RELATED SECTIONS

- A. Section 15950 – Controls
- B. Section 15985 – Sequence of Operation and Point/Data List
- C. Other division 15, 16 and/or 17 sections that specify the Subsystems to be integrated to the IBAS.

1.02 RELATED WORK

- A. This section along with those for the integrated Subsystems are responsible for joint efforts in integrating the Subsystems to the IBAS.
- B. The Controls Contractor and Contractor for other integration division 15/16/17 Subsystems shall set up the Subsystems to communicate the specified data with the IBAS. Subsystems that are BTL-listed shall be set up to use BACnet Alarm and Event services for alarm reporting and BACnet Schedule/Calendar objects for scheduling.
- C. Communications address and device/object instance numbering are the responsibility of each Subsystem's Contractor.
- D. All modifications to the IBAS for representing/controlling data from the Subsystems (e.g., graphics, alarm reporting, trend data presentation, schedule viewing/changes, etc.) are the responsibility of this section's Contractor.
- E. This sections' Contractor shall review the sections for all integrated Subsystems to determine the scope of the communicated data and operator interface functions for the IBAS.
- F. See Part 3 of this section for more information.

1.03 SUBMITTALS

- A. Prior to commencement of the work submit:
 - 1. Graphic Screens and Reports:
 - a. Meet with the DPS Controls Application Engineer and the Subsystem contractors prior to developing the following submittals to determine the graphic screen design, any communicated point/data list additions/choices, the point/data naming convention, the alarming/trending requirements (including alarm priority levels), the schedules required, and/or any other items listed below regardless of their level of definition in the design.
 - b. Submit for approval a list of the graphic/report screens to be provided; and, for each screen, provide a conceptual layout of the screen and data, including those linkages to other pages/screens. Details on the required graphics/reports are in Part 3 of the specification.
 - 1) All Subsystem data shall be represented or listed.
 - 2) The point/data naming convention to be used.
 - 3) All operator interface functions required by the specification shall be represented.
 - 4) For Subsystems that are not BTL-listed (and/or do not support BACnet Alarm & Event services, Schedule/Calendar objects, and/or Trend Log objects):
 - a) Include an alarm list that defines the messages to be used for each class of alarms, and the routing (i.e., to what printers/terminal) of each class of alarms.
 - b) If applicable, include a start/stop schedule list that defines each unique schedule to be provided, the details of the schedule, and the equipment affected by the

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schedule.

- c) Include a list of all points/data to be trended.
 - 5) For each screen proposed include a list of all setpoints and other operating parameters to be available via the IBAS.
 - 6) The data to be trended.
 - 7) Coordinate the above effort with the Subsystems' contractors to ensure that it properly represents the designs.
- 2. System Test Plan – Submit the plan and forms to be used in the System Test procedures described in Part 3.
 - 3. Commissioning: Coordination operation with testing and balancing and controls contractor.
 - 4. Any product data sheets, if applicable.
 - B. Upon acceptance of the system installation submit the following as-built documentation:
 - 1. Completed test forms.

1.02 WARRANTY

- A. Manufacturer shall guarantee the work to be free from defects in workmanship under normal use for a period of 24 months from date of acceptance of system by Owner.
- B. Modify any defective workmanship within guarantee period, immediately, without cost to Owner.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. The existing IBAS hardware/software system shall be used for execution of the work required herein.
- B. Communications wiring, routers, gateways, switches, etc. specified/installed under other section. Unless otherwise determined no hardware or software products/installation, (e.g., routers, gateways, communications wiring/devices) are required in this section for IBAS operation.
- C. The IBAS is not capable of executing any control sequences. All building Subsystem sequences shall be executed by the Subsystems' controls.
- D. Failure of the IBAS shall not interrupt normal operation of any of the building Subsystems.

2.02 SYSTEM ARCHITECTURE

- A. System Level:
 - 1. Each of the following Subsystems, when IBAS integration is included in the project , shall be specified with a separate point of interface to the IBAS.
 - a. HVAC System
 - 1) Note – All HVAC equipment controls (including that provided with the equipment) shall be integrated to the DDC System. The DDC System in turn communicates all required IBAS points/data to the IBAS.
- B. Building Level:
 - 1. All Subsystems shall communicate to the IBAS via BACnet/IP or JCI N1 (the latter is only acceptable if explicitly specified)
 - 2. Exceptions/Clarifications:
 - a. Any Subsystem not available with BACnet/IP (or N1) communications shall be integrated to the

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DDC System using BACnet MS/TP, Modbus, etc. The Subsystem's points/data shall in turn be routed to the IBAS via the DDC System.

- b. HVAC equipment controls provided with the equipment (i.e., chiller controls) shall communicate directly with the IBAS if the equipment is provided with a BACnet/IP interface. However, the DDC System shall still be responsible for simultaneous communications with this equipment for use in meeting the 15985 Sequence of Operation.

C. IBAS Enterprise Level:

- 1. The Subsystems in each DPS building shall communicate with the IBAS via the DPS intranet.

2.03 NETWORK ROUTERS & GATEWAYS

- A. All communications hardware/software needed for communicating BACnet/IP data to the IBAS is provided under other sections.
- B. All communications hardware/software needed for other interfaces (e.g., BACnet MS/TP, Modbus, etc.) is provided under other sections.

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. No work shall disturb the operation of the IBAS for use in operating other DPS school's.
- B. Work on the IBAS shall be scheduled in advance with the DPS Controls Application Engineer.
- C. Time Synchronization – All 15950 controllers with real-time clocks shall be synchronized from the real-time clock in the IBAS at least once every 24 hours.
- D. Develop IBAS graphic screens and other functions in accordance with manufacturer's instructions.

3.02 POINT/DATA INTEGRATION

A. General

- 1. Points/data to be mapped are listed in 15985, on the drawings and/or in the Subsystem specifications.
 - a. The final list of points/data to be integrated shall be defined by the submittal process as defined in Part 1.
- 2. All DDC System input and output points shall be mapped into the IBAS. .
- 3. Physical points shall be mapped into the appropriate BACnet I/O point objects. If possible.
- 4. Equipment modes (e.g., economizer, warm-up, etc.) and setpoints shall be mapped into BACnet MD, BD or AD objects.
- 5. Map any other data required for operation of the IBAS functions (i.e., start/stop schedule data).
- 6. BACnet objects shall use the BACnet standard's object instance numbering scheme.
- 7. Point/Data Operator Override - Any manual operator actions described by the DDC System or other Subsystem sequences shall be available from the IBAS.

B. Alarms

- 1. The following applies to Subsystems that are BTL-listed as B-BC or AAC devices and/or support BACnet Alarm & Event services.
 - a. Subsystems that are not BTL-listed or support the above services shall be polled by the IBAS for any alarms.
 - b. Alarms algorithms shall be set up in the IBAS for any Subsystems that do not perform alarm monitoring of its system points (i.e., the target object shall be polled by the IBAS and compared to high/low limits or normal/off-normal states by the IBAS).

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2. Alarms (i.e. limits, messages, priorities) shall be set up in each Subsystem by the Subsystem contractor.
3. Alarms shall be automatically communicated from the Subsystem to the IBAS in real-time.
4. When requested by the IBAS, the Subsystem shall provide an alarm summary.
5. Alarm priority – Coordinate with the Subsystem contractor concerning the specific alarm priority values to be used.

A. Historical Data Trending

1. The following applies to Subsystems that are BTL-listed as a B-BC and/or supports the BACnet Trend Log object.
 - a. Subsystems that are not BTL-listed or support the Trend object shall be polled by the IBAS for trending requirements.
2. Trends shall be set up in the Subsystem by the Subsystem contractor.
3. The IBAS shall read trend data (i.e., via the BACnet Trend Log object) every 48 hours (or sooner if the trend log has reached capacity), or whenever needed to fulfill an operator display request (i.e., to display a trend report on the IBAS).

3.03 ALARM REPORTING AND MANAGEMENT

- A. Set up the IBAS so that the alarms for this project are properly received, processed and routed.
- B. Receipt of an alarm shall be indicated on any graphic that includes associated point data. This indication shall be both textual and graphical (i.e., the point name and/or associated device shall change color, flash, and/or etc.).
- C. The alarm shall be identified by the IBAS as being received from this building and routed to the alarm summary for this building.

3.04 GRAPHIC SCREENS

- A. The system shall be provided with color graphic screens that show all of the controlled systems with all associated points, setpoints and modes of operation. including:
 1. Opening screen graphic showing the building, campus, facility, etc.
 2. Each HVAC air and water system monitored or controlled.
 3. Each floor and zone controlled (floor plan) - both HVAC and smoke detectors where applicable.
 9. Each miscellaneous monitored or controlled point.
 10. Screens for any Subsystems not listed above with all points/data represented.
 11. Menu penetrations: "buttons" shall be provided to allow the user to easily move among the various graphics and menus. At any time, the operator shall be able to return to the main menu with one mouse click and shall switch from graphic to other modes within two mouse clicks.
- B. The final selection and design of graphic screens shall be determined as part of the submittal process as defined in Part 1.

3.06 TESTING AND ACCEPTANCE

- A. The tests described herein are to be performed after Contractor has performed their own system start-up testing performed as a necessary part of the installation, startup, and debugging process.
- B. The testing required below shall be observed by the Owner, and coordinated with the Owner and Subsystem contractors. The Subsystem contractors shall participate in the tests associated with their system.

SECTION 15975 – INTEGRATED BUILDING AUTOMATION SYSTEM (IBAS)

C. Testing:

1. The IBAS work shall be tested for proper operation.
2. The Contractor shall use a protocol packet analyzer (i.e., Wireshark or any other “sniffer” with a BACnet message decoding capabilities) to:
 - a. Verify that the IBAS communications is not generating excessive network traffic (i.e., high packet reject rates), excessive polling by the IBAS, excessive alarm/event messages sent by the Subsystems.
 - b. Verify that all messages between the IBAS and the Subsystems are properly formed.
3. Testing shall demonstrate the end-to-end integrity of all data communications and user commands between the Subsystem(s) and the IBAS.
4. Selected time schedules, set point and control mode modifications, and output overrides shall be verified by changing the schedule and observing the correct response of the controlled outputs.
5. Communication with each Subsystem controller with a testing of the operation of sample of messages/services expected.
6. Specified IBAS reports and trend logs shall be demonstrated.
7. Alarms shall be demonstrated, along with the output to the alarm GUI.
8. Workstation commands and operating screens shall be explained and demonstrated.

D. Owner and Engineer shall review installation and operation of IBAS, and prepare a list describing any deficiencies (punch list).

E. Upon receipt of list of deficiencies from Owner, Contractor shall prepare written report indicating by Subsystem each outstanding item on list. Contractor shall correct items appearing on installation-inspection report and present written request for re-inspection and approval to Owner.

F. Upon satisfactory completion of punch list and successful demonstration of operation for all components, Owner shall provide acceptance of IBAS. The date of Owner acceptance shall constitute the start of the warranty period.

G. On the date of acceptance, Contractor shall provide the project record documentation.

3.06 INSTRUCTION AND TRAINING

A. Upon completion of work and acceptance by Owner, IBAS representatives shall provide 16 hours of instruction/training to 4 of Owner’s operating personnel. This instruction/training shall, at a minimum, consist of a review of the GUI screens created for the project, operator capabilities, as-built documentation, the specific IBAS Interface technology utilized plus a walk through of the Project to identify equipment locations and to answer site questions.

END OF SECTION

SECTION 15985 – CONTROL SEQUENCE OF OPERATION AND POINT/DATA LIST

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.01 SEQUENCE OF OPERATION

A. Constant Volume Air Handler :

1. The occupancy mode (occupied-unoccupied) shall be determined through a user-adjustable, graphical, seven-day schedule with an additional holiday schedule.
 - a) Occupied Mode:
 - i) All fans shall have a starter with 'hand-off-auto' switch.
 - When the starter switch is in the 'hand' position, the fan shall run. When the switch is in the 'off' position the fans shall stop. When the switch is in the 'auto' position, the fan shall be under the control of the DDC Controls System.
 - The supply fan shall be energized.
 - ii) Whenever the supply fan is energized, the return/exhaust fan shall be energized.
 - iii) Discharge air temperature setpoint shall be reset based upon outdoor air temperature according to the following reset schedule. All parameters shall be independently adjustable.
 - The cooling coil control valve shall modulate to maintain the discharge air temperature setpoint, 55 degrees F (adjustable).
 - The heating coil control valve shall modulate to maintain the discharge air temperature as described below.
 - 01) Discharge air temperature setpoint is 55 degrees F (adjustable) when outdoor temperature is greater than 70 degrees F.
 - 02) Discharge air temperature setpoint is 65 degrees F (adjustable) when outdoor temperature is less than 30 degrees F.
 - The local DDC Controller shall modulate the Re-heat coils control valve in the zone duct to maintain the space setpoint, 72 degrees F.
 - iv) Economizer Control: Whenever the outside air temperature is above the space temperature (75 degrees F, cooling; 72 degrees F, heating) the outside air and return air dampers shall be positioned for the minimum outside air scheduled. Or the CO2 sensor in the return air duct shall modulate the outside and return air dampers to maintain the minimum outside air required for the occupancy. When the outside air temperature is below 55 degrees F (adjustable), the outside and return air dampers shall be positioned to maintain the mixed air temperature.
 - v) Filter Status: A differential pressure switch across the filter shall signal an alarm when the pressure drop across the filter is above the allowed minimum (adjustable). Provide a local light to indicate that the filter is to be changed. Red shall indicate filter to be changed. Green shall indicate that filter is adequate.
 - b) Unoccupied Mode:
 - i) The supply and return fans shall be de-energized. Both outdoor air dampers and exhaust dampers shall be closed. The return air damper shall be open.

SECTION 15985 – CONTROL SEQUENCE OF OPERATION AND POINT/DATA LIST

- ii) The heating coil valve and pump shall cycle to maintain mixed-air temperature of 45 degrees F (adjustable).
- iii) The supply fan shall cycle to maintain the unoccupied setpoint temperature (65 degrees F, adjustable).
- iv) If the unoccupied space temperature is not maintained the heating control valve shall modulate to maintain the space temperature. And the supply fan shall cycle on.
- c) Morning Warm-up:
 - i) When the outside air temperature is below 55 degrees F, the DDC system shall perform a morning warm-up cycle prior to the occupied mode.
 - ii) The outside air damper shall be closed and the return air damper shall be open.
 - iii) The supply fan shall energize and the heating coil control valve shall open.
 - iv) The Air Handling Unit shall remain in the morning warm-up mode until the return air temperature is 70 degrees F. After the system has achieved 70 degrees F (adjustable) the system shall enter the Occupied Mode.
- d) Safety Shutdowns:
 - i) Duct smoke detection, high-pressure safeties and low-temperature limit trips shall de-energize the air-handling unit supply and return fans and close the outdoor air and exhaust air dampers. Manual reset shall be required to allow the fans to operate.
- e) Freeze Protection:
 - i) When the outdoor air temperature is below 40degrees F (adjustable), the HW and CHW pumps shall be energized continuously for freeze protection. The heating coil valve shall cycle as described elsewhere.
 - ii) If the unit has shutdown on the low temperature limit switch, energize the return fan until the condition has been resolved.

3.10 EXHAUST FANS & SUPPLY FANS

- A. See Drawing for Control Sequence.

PART 4 POINT/DATA LIST

- A. General information:
 - 1. These lists include the point/data that should be available for viewing/modification at the IBAS. Other points/data needed by the DDC or other systems to provide their specified functionality are not necessarily listed here. It is the A/E's responsibility to ensure that all points/data required for the DDC of other systems be specified.
 - 2. Under the "Point/Data" column "Occupied Until..." is a time clock value indicating the end of the occupied mode.
 - 3. Under the "Type" column: AO = Analog Output Point, AI = Analog Input Point, BO = Binary Output Point, BI = Binary Input Point, AD = Analog Data, and BD = Binary Data.
 - 4. Under the "R/W" column: R = Read (or monitor) and W = Write (or control)
 - 5. Under the "Notes" column "Emergency" means that an off-normal condition shall generate an emergency-level alarm sent to security or the HVAC Shop (contractor is to consult with owner about where, in each case, the alarm shall be sent and what the alarm message shall state).
 - 6. There may be more than one instance of each point listed. Provide all instances included in the DDC or other system design.
 - 7. Not all points listed are applicable (or applicable as described) for the specific HVAC or other system design. Further some HVAC or other system designs may involve points that could not have been predicted by or included in the below list. The design engineer shall edit the list accordingly.

- B. Point/Data Lists (by HVAC or other system type)

1. Constant Volume AHU, RTU or H&V Unit

SECTION 15985 – CONTROL SEQUENCE OF OPERATION AND POINT/DATA LIST

Point/Data	Type	R/W	Notes
Mixed Air Dampers Actuator(s)	AO	R/W	Provide additional points if the DDC system controls these dampers with multiple points (e.g., a separate AO for the relief or exhaust air damper or a separate BO for a minimum outside air damper).
Mixed Air Temperature	AI	R	
Return Air Temperature	AI	R	
Heating Coil Valve	AO	R/W	Or stages of elec/gas heat controlled by multiple BO's. Provide BI status for gas furnace.
Cooling Coil Valve	AO	R/W	Or stages of DX cooling controlled by multiple BO's
Heating Coil Circulation Pump	BO	R/W	
Cooling Coil Circulation Pump	BO	R/W	
Heating Coil Circ. Pump Status	BI	R	
Cooling Coil Circ. Pump Status	BI	R	
Preheat Coil Valve Open/Close	BO	R/W	
Preheat Coil Face and Bypass Dampers	AO	R/W	
Preheat Discharge Air Temperature	AI	R	
Preheat Discharge Air Temperature Setpoint	AD	R/W	
Supply Fan Start/Stop	BO	R/W	
Supply Fan Status	BI	R	
Freezestat	BI	R	
Supply Air Temperature(s)	AI	R	
Supply Air Temperature Setpoint	AD	R/W	If reset off of space temperature.
Space Temperature	AI	R	Emergency
Space Temperature Set Points	AD's	R/W	Four AD's – Heating Occupied/Unoccupied and Cooling Occupied/Unoccupied
Space Temperature Set Point Adjustment(s)	AI or AD	R	At space temperature sensor
Zone Reheat Coil Modulation	AO	R/W	For reheat systems
Filter Status	BI	R	
Smoke Detector	BI	R	
Return Fan Start/Stop	BO	R/W	Only if not hard-wire interlocked to supply fan start/stop.
Return Fan Status	BI	R/W	
Exhaust Fan Start/Stop	BO	R/W	Only if not hard-wire interlocked to supply fan start/stop.
Exhaust Fan Status	BI	R/W	
CO ₂ Sensor	AI	R	
CO ₂ Set Point	AD	R/W	
Face & Bypass Dampers Actuator	AD	R/W	Emergency
Mixed Air Temperature Low Limit Set Point	AD	R/W	
Occupied Until....	AO	R	
Warm-up Mode	MD	R	
Economizer Mode	BD	R	
Minimum Outside Air Position or Air Flow Set Point	AD	R/W	
Outside Air Flow	AI	R	

SECTION 15985 – CONTROL SEQUENCE OF OPERATION AND POINT/DATA LIST

Supply Air High Static Alarm	BI	R	
Return Air Low Static Alarm	BI	R	
Supply Air Temperature Set Point	AD	R/W	
Supply Air Duct Static Pressure Set point	AD	R/W	
Building Static Pressure Set point	AD	R/W	
Average or Warmest Space Temperature	AD	R	If used for supply air temperature reset
Evaporative Cooling Sump Fill/Drain	BO	R/W	
Evaporative Cooling Drain/Fill Outside Air Set Point	AD	R/W	
Evaporative Cooling pump start/stop	BO	R/W	
Evaporative Cooling fan status	BI	R	Indirect systems only

Space Temperature Set Points	AD's		Four AD's per zone – Heating Occupied/Unoccupied and Cooling Occupied/Unoccupied.
Space Temperature Set Point Adjustment	AI or AD		At each space temperature sensor

5. Supply Air Unit and Exhaust Fans

Points	Type	R/W	Notes
Outside and Exhaust Air Dampers	BO	R/W	
Supply Fan Start/Stop	BO	R/W	
Supply Fan Status	BI	R	
Exhaust Fan Status	BI	R	Also provide a BO, R/W if the start/stop
Occupied Until...	AD	R	
Occupied/Unoccupied mode/Night Purge	BD	R/W	
Duct Smoke Detector	BD	R	

15. Miscellaneous*

Points	Type	R/W	Notes
Exhaust Fan Start/Stop	BO	R/W	Provide point data for each exhaust fan controlled by the DDC system but not associated with an AHU/RTU/MUA
Exhaust Fan Status	BI	R	Same as above
Outside Air Temperature	AI	R	
Outside Air Relative Humidity	AI	R	

END OF SECTION

SECTION 15990 – TESTING, ADJUSTING AND BALANCING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: requirements for balancing the air and hydronic heating, ventilating and cooling systems to satisfy the project building design conditions.
- B. This contractor shall do the work under the general contractor.

1.02 QUALITY ASSURANCE

- A. Pre-qualified Contractors
 - 1. Checkpoint
 - 2. Finn & Associates
 - 3. TAB Services
 - 4. Griffith Engineering
 - 5. JPG Engineering
 - 6. Double T Balancing
- B. Mechanical contractor shall obtain approval in writing from balancing contractor for type and size of balancing devices.
- C. Qualifications
 - 1. Work under this section shall be executed under the direct supervision of a registered professional engineer having an established professional office in the state of Colorado and having an experience record of not less than five (5) years in the mechanical contracting industry, engaged in testing, balancing and adjusting of air and hydronic mechanical systems for not less than two (2) years of that time.
- D. Calibration and maintenance of instruments shall be in accordance with manufacturer's standards and recommendations, and calibration histories for each instrument available for examination.
- E. Accuracy of measurements in accordance with the applicable measurement means as listed in the chapter on measurement and instruments in the latest edition of ASHRAE Fundamentals Handbook.
 - 1. The TAB Contractor shall have obtained CAD reduced-size drawings from Engineer for the TAB report.
 - 2. The TAB shall return to the site to perform spot checks as directed by the DPS Project Manger during the commissioning process. The TAB shall include a minimum of 2 days on to provide spot checks as required by the commissioning agent.

1.03 STATUS OF SYSTEMS

- A. Air and water testing and balancing shall not begin until the system to be tested has been cleaned and flushed, and is in full working order. Where glycol is used, it shall be installed prior to hydronic balancing.
 - 1. Coordinate scheduling of work with the general contractor and appropriate subcontractors. Schedule TAB work to coincide with testing and verification of control systems.
 - 2. Provide written notification (within 24 hours) to the general contractor, engineer, and owner or his/her representative of any component and/or system deficiencies.
- B. Review available plans and specifications for the project and make visual observations during construction to determine that required balancing devices are being installed properly, and access to them is provided.
- C. Before any air balance work is done, systems shall be checked for:
 - 1. Excessive duct leakage. Excessive duct leakage shall be corrected.
 - 2. Dirt and debris in ducts and/or air handling units (AHUs).

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3. Filters are installed and changed if they are dirty.
 4. Coil fins are clean and combed where needed.
 5. Verify motor rotation and correct if necessary.
 6. Excessive vibration. Excessive vibration shall be corrected.
 7. Equipment has been lubricated in accordance with manufacturer's recommendations..
 8. Proper operation of automatic control and smoke dampers shall be verified.
 9. Manual control dampers, fire dampers, and air outlet dampers are wide open.
 10. Duct end caps are properly installed and access doors closed.
 11. Grilles, registers, and diffusers are properly installed.
- D. Put heating, ventilating, and air conditioning systems and equipment into full operation and continue operation of same during each working day of testing and balancing.
- E. For remodels and additions, TAB shall include the entire system being worked on. TAB of an extended or modified branch only shall not be accepted.

PART 2 PRODUCTS

2.01 EQUIPMENT

- A. Provide all instruments, tools, scaffolding, and ladders necessary to perform the work.

PART 3 EXECUTION

3.01 PERFORMANCE OF WORK

- A. Air Balance
1. Balance air supply, return, and exhaust systems and record air quantities for each air device.
 - a) The pilot tube traverse method for determining main duct CFM shall be used and recorded wherever possible; flow hood measurements at registers and diffusers may be totaled for branch duct quantities.
 2. Air diffuser pattern shall be set to minimize objectionable drafts and noise.
 3. The supply, return, and exhaust fan static pressures shall be set by the balancing firm (and the controls contractor if the systems have fan volume control).
 - a) The lowest fan speed resulting in satisfactory system performance shall be determined at full design delivery. Any inlet or outlet fan volume (balancing) dampers shall be in the wide-open position, and one path presenting the greatest resistance to flow shall be fully open and unobstructed.
 - b) Fan RPMs shall not be increased by more than 10 percent without prior authorization from the engineer.
 - c) All adjustable speed sheaves on multiple-belt systems shall be replaced with fixed-speed sheaves by the balancing contractor. Sheaves shall be provided by mechanical contractor.
 4. Provide system static pressure profiles that identify pressure differences across all components of air handling units and built-up systems. Pressure drops shall be individually measured and recorded for intake and exhaust vents, hoods, louvers, manual and auto control dampers, filters, coils, evaporative coolers, fans, etc.
 6. When air balancing is done and manual dampers are set, all test holes shall be plugged and all manual damper positions shall be marked.

SECTION 15990 – TESTING, ADJUSTING AND BALANCING

3.02 SYSTEM TOLERANCES

A. Allowable tolerances

1. Tolerances of adjustment for air handling systems: \pm 5 percent for supply systems and \pm 10 percent for return and exhaust systems from figures shown on drawings.
2. Tolerances of adjustment for hydronic systems: \pm 10 percent of design conditions shown on drawings.

3.03 TAB REPORT

A. The report shall include all test and balance data, as well as information on any discrepancy from specifications or performance standards. All discrepancies shall be included in a separate section. As a minimum, the following items shall be included:

1. Belt and drive sheave information (as installed and as changed), fan nameplate information, motor nameplate information, and amperage and voltage to all motors (in various operating modes where applicable). Also, maximum and minimum RPM settings on VFD units.
2. Static pressure drops across all components of the air systems. Static pressure profile for each AHU system.
3. Required and final balanced CFM at each system terminal unit. Include the terminal size, inlet static pressure, temperature, and velocities read to attain the required CFM.
4. Motor nameplate information, amperage and voltage to all motors.
6. Overload protection data for all motors shall be recorded. Starter and/or VFD brand, model, enclosure type, installed overload devices, original ratings and set points (and revised device ratings and set points when applicable) shall be recorded. If the starters (and/or VFDs) were furnished by the mechanical contractor, the overloads shall be verified and changed to the correct size when necessary, and so noted in the report. If the starters were furnished by the electrical contractor, the correct overload device sizes and settings shall be noted in the report and the electrical contractor shall be advised of all discrepancies.

B. A reduced set of drawings (11" x 17") shall be included in the report with all terminals (VAV boxes, air outlets, inlets, coils, unit heaters, finned tube loops, radiant panel loops, etc.) clearly marked, all equipment designated, and all referenced to the device test reports. The contract drawings may be reduced and used for this purpose, if they remain legible. Otherwise, CAD reduced-size drawings shall be obtained from the engineer.

C. The TAB contractor shall submit bound copies of the final TAB report to the owner or his/her representative at least 15 days prior to the mechanical contractor's request for final inspection. The report shall include all operating data as previously listed, a list of all equipment used in TAB work, and shall be signed by the supervising professional engineer or certified TAB supervisor and certified TAB technician, and affixed with his certification seal. Final acceptance of this project will not take place until a satisfactory report is received.

3.04 FIELD VERIFICATION

A. Upon request of the owner or engineer, a representative of the balancing firm performing the work shall demonstrate fluid flow quantities shown in the report by reading back outlets or terminals selected at random. It is understood that the operating mode of the system shall be the same for the readback as it was during balancing, and the number of readings verified will not exceed 10 percent of the total in the report.

B. When deemed necessary by the owner or engineer, the balancing firm shall run temperature, pressure, and/or humidity recordings, and shall be prepared to verify any of the report test results in the presence of the owner and/or engineer when requested.

END OF SECTION 15990

PART 1 GENERAL

1.01 REFERENCES

- A. In addition to references found in standard Section 01060, electrical design and installation shall meet, as a minimum, the most recent applicable versions or regulatory requirements of the following:
 - 1. Federal and state regulations
 - 2. City and County of Denver regulations
 - a) Denver Fire Prevention Bureau regulations
 - 3. OSHA
 - 4. ANSI/NFPA 70 (National Electric Code) as adopted by the AHJ
 - 5. NEMA
 - 6. IEEE
 - 7. ANSI
 - 8. ANSI/IEEE C2 – National Electrical Safety Code (NESC)
 - 9. NFPA 101 – Life Safety Code
 - 10. NECA – Standard of Installation

1.02 OPERATION AND MAINTENANCE INFORMATION

- A. Include the following information, in addition to operation and maintenance information required by Division 1 standards and other Division 16 standards.
- B. Include a complete list of product data and shop drawings, acceptance tests, warranties, certificates, sub-contractor and supplier information (i.e. name, address, and phone no.).
- C. Include schematic diagrams and point-to-point wiring diagrams for the following systems.
 - a) Fire detection/alarm systems

PART 2 PRODUCTS

2.01 EQUIPMENT

- A. Electrical equipment shall bear the U.L. label for the use intended.

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

- A. The contractor shall hire an independent testing agent to conduct operating and acceptance tests on new electrical system components and all existing devices which are impacted by the project.
- B. The testing agent shall prepare written reports of values of all test readings and procedures. Reports shall include all breaker settings and modifications to one-line and three-line drawings.
- C. The testing agent shall furnish all equipment, instruments and personnel required to conduct tests.
- D. Test will be defined in the individual section describing the equipment or system.

3.02 INSTALLATION

- A. Suspension and anchorage
 - 1. Use of powder actuated fasteners and toggle bolts are prohibited.
 - 2. Steel roof and floor decking, suspended ceilings, and hollow assemblies shall not be used for the attachment of anchorages or supports for suspended equipment, conduit pipes, or other electrical system components.
 - a) Exception: Attachment, anchorages, or supports specifically approved by a Structural Engineer.

DENVER PUBLIC SCHOOLS
DESIGN AND CONSTRUCTION STANDARDS
SECTION 16010 – BASIC ELECTRIC REQUIREMENTS

3. Equipment shall be anchored with anchors extending through the housekeeping pad or curb into the floor, except where the housekeeping pad is an extension of an inertia block separated from the floor structure.
4. Specify use of retaining clips/clamps in locations where vibration may be a concern.
5. Drilling, cutting or burning of, or welding to, structural members for attachment of hangers and supports is subject to prior approval by the A/E.
6. Wall assemblies are not an acceptable replacement for hangers.
7. Signs shall be secured to a fixed device or the building wall with corrosion-resistant chains or fasteners.

3.03 CLEANING

- A. Clean electrical equipment, such as switches, panelboards, luminaires, etc., of construction dirt, dust, paint smears, etc., and touch-up or repaint all scars, blemishes, rust spots, etc., to original state of finish.
- B. Vacuum interior of all switches, switchboards, panelboards, luminaires, junction boxes, outlet boxes, control panels, and other electrical enclosures.

3.04 DEMONSTRATION

- A. Contractor shall provide training for DPS maintenance personnel for systems and equipment as required by the Division 16 Sections.
- B. The system manufacturer shall include factory training seminars for DPS maintenance personnel. Training seminars shall address operation, testing and maintenance of the system.
- C. System manufacturers shall provide certificates of training to attending DPS personnel.

END OF SECTION 16010

PART 1 GENERAL

1.01 REFERENCES

- A. Specify Underwriters Laboratories (UL) listed equipment, assemblies and materials.
- B. Where appropriate, refer to current ANSI and NEMA Standards for material ratings.
- C. National Electrical Code (NEC) (current edition).

1.02 SUBMITTALS

- A. Operation and Maintenance Manuals: Provide at a minimum general description and technical data.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Rigid Metal Conduit: galvanized steel with steel threaded fittings.
- B. Intermediate Metal Conduit: galvanized steel with steel threaded fittings.
- C. Electrical Metallic Tubing: all steel set screw fittings for interior locations.
- D. Flexible Metal Conduit: galvanized steel with all steel fittings.
- E. Compression-type fittings (squeeze types).
- F. Liquid Tight Flexible Metal Conduit:
 - 1. Galvanized steel with plastic jacket.
 - 2. Specify fittings which provide grounding continuity.
- G. Non-Metallic Conduit and Fittings:
 - 1. PVC plastic Schedule 40.
- H. Impregnated fiber duct (underground).
Prohibited Materials:
 - 1. Use of aluminum conduit is specifically prohibited unless special written permission is given by DPS Construction Services Engineer.
 - 2. Use of extra-flexible, non-labeled conduit is prohibited
 - 3. ENT (electrical non-metallic tubing) is prohibited
 - 4. Type AC or MC cable is not allowed as a substitute for cable in conduit.
- I. Surface Wireways:
 - 1. Steel with factory-applied paint finish or natural brushed or stainless steel finish. Coordinate finish selection with Architect prior to bid.
 - 2. Provide two channels, one for power and one for data wiring, minimum size Wiremold 4000 or equivalent.
 - 3. Minimum size for single channel raceway shall be Wiremold 700 or equivalent.

PART 3 EXECUTION

3.01 INSTALLATION AND APPLICATION

- A. Conduit Sizing, Arrangement and Support:
1. Rigid Conduit:
 - a. For power receptacle and lighting circuits, the minimum conduit size shall be ½”.
 - b. Size conduit to meet requirements of National Electric Code for 90°C rated cable and appropriate insulation fill tables.
 2. Flexible conduit :
 - a. Minimum flexible conduit size shall be ½”.
 - b. Maximum length of flexible conduit is 3’, except for connections to lighting equipment which may be up to 6’ maximum length.
 - c. 3/8” flexible conduit is permitted if furnished as part of a manufactured equipment connection (including lighting equipment).
 3. Conduit straps and hangers:
 - a. Heavy-duty malleable iron or steel.
 - b. For locations above grade which are subject to moisture or corrosion including crawl spaces, specify corrosion-resisting steel.
 - c. Perforated pipe strap, wire hangers, or spring steel fasteners with hangers are not permitted. d) Support conduits above suspended ceilings from building structure by suitable hangers.
 - d. Supporting conduits from ceiling suspension wires is not permitted.
 4. Conduit racks:
 - a. For electrical conduit use only.
 - b. Multi-use suspension systems for plumbing and other piping along with electrical conduits may be used if designed for that purpose. Maintain 6” clearance between electrical conduits and all other piping.
 5. Conduit anchors: Plastic or fiber expansion and powder-activated anchors are prohibited.
- B. Anchors must be mounted using removable bolts or screws.
Interior Conduit Installation:
1. Rigid metal conduit shall be used or specified for the following locations:
 - a. Corrosive and/or hazardous locations. Provide plastic jacket or coating in corrosive installation and coming out of slabs.
 - b. Surface-mounted conduits on pads or floors of mechanical rooms and in other unfinished spaces.
 2. Intermediate metal conduit: Not allowed.
 3. Electrical metallic tubing shall be used or specified for the following locations:
 - a. Above Ceilings
 - b. Interior Partitions
 - c. Exterior walls, above grade.
 - d. Prohibited in hazardous or corrosive areas.
 - e. Prohibited in concrete slabs or walls.
 - f. Prohibited below grade.
 4. Flexible metal conduit shall be used or specified for the following locations:
 - a. Motor final connections.
 - b. Transformer final connections.
 - c. Mechanical equipment final connections.
 - d. Lighting equipment final connections.

5. Liquid tight flexible metal conduit shall be used or specified for the following locations:
 - a. Outdoor installations only where flexibility of connection is required.
 - b. Damp or wet installations, including kitchens.
 - c. Corrosive installations.
 - d. Motors in wet, damp locations or subject to oil drip.
 - e. Final 3' connection to all sprinkler and preaction valves.
 6. No conduit is allowed in concrete slabs and walls or underneath concrete slabs.
 7. Expansion joints: Where conduits cross building expansion joints, the Contractor shall furnish and install a sliding expansion joint. Expansion joints shall be installed with required bonding straps and clamps.
 8. Incompatible materials: Do not permit use of dissimilar metal fittings on raceway systems. All fittings and conduits must be of compatible materials.
 9. PVC conduit is prohibited for interior use.
 10. Aboveground raceways:
 - a. PVC conduit is prohibited aboveground.
 - b. Route conduits as straight as possible between points.
 - c. Require that each raceway be proved clean, clear and useable, with a #12 copper pull wire left in place. Specify duct plugs for finished raceways.
 11. Rooftop Raceways
 - a. Rooftop raceways will be kept to a minimum.
 - b. Route raceways up through curbs as much as possible to prevent unnecessary rooftop penetrations when wiring rooftop units.
 - c. Raceways that are required on rooftops will be cleared first by the DPS Project Manager or DPS Electrical QAQC.
 - d. Adjustment factors that fall under NEC Article 310 Conductors for General Wiring Circular Raceways Exposed to Sunlight on Rooftops will be followed.
- C. Surface Raceways: Require electrical continuity of all raceway components throughout length of system. Metal raceway or conduit is not to be used as a grounding path.

END OF SECTION 16110

PART 1 GENERAL

1.01 REFERENCES

- A. Specify Underwriters Laboratories (UL) listed equipment, assemblies and materials.
- B. Where appropriate, refer to current NEMA Standards for material ratings.
- C. National Electrical Code (NEC) (current edition).

PART 2 PRODUCTS

2.01 BUILDING WIRE

- A. Insulated Wire:
 - 1. Types THHN, THWN, XHHW; rating 600V, 90°C or higher.
 - 2. Insulation types specified shall conform to NEC requirements for temperature, moisture, and mechanical environmental conditions.
- B. Conductor Material:
 - 1. Conductors #10 AWG and larger, stranded copper.
 - 2. Conductors #12 can be stranded copper.
 - 3. Conductors smaller than #12 AWG, solid copper.
- C. Control Wire: Stranded copper with 600V insulation, 90°C or higher.
- D. Minimum Size:
 - 1. Minimum wire size of #12 AWG for power and lighting circuits.
 - 2. Minimum wire size #14 AWG for control and signal circuits.

2.02 REMOTE CONTROL AND SIGNAL CABLE

- A. Class 1, 2, or 3:
 - 1. Shall comply with NEC Article 725
 - 2. Class 1: Copper conductor, 600V insulation, rated 75°C or higher.
 - 3. Class 2 & 3: Listing and marking per NEC Article 725.
 - 4. All control and signal cables shall be installed in conduit except for security wiring. See relevant section for Security system wiring.

2.03 MODULAR WIRING SYSTEMS

- A. Modular wiring systems are not allowed.
- B. Type AC and MC cable are not allowed.

2.04 TERMINATION

- A. Splices and taps are to carry full ampacity of conductors without perceptible temperature rise.
- B. Temperature rating shall match cable temperature rating.

PART 3 EXECUTION

3.01 INSTALLATION

SECTION 16120 – WIRE AND CABLE

- A. Device removal in a multi-wire branch circuit: where a circuit extends through a receptacle, it shall be a requirement that all conductors shall be pigtailed so downstream load does not go through receptacles.
- B. Wire Sizing:
 - 1. For 20 ampere 120V circuits longer than 75', use #10 AWG conductors.
 - 2. For 20 ampere 277V circuits longer than 150', use #10 AWG conductors.
 - 3. For circuit amperes other than 20 ampere and for distances greater than listed above, calculate voltage drop and size conductors for maximum three (3) percent voltage drop.
- C. Wire Color Coding:
 - 1. Color code wires for building voltage classes as follows:
 - a. 120/208V-3Ø:
 - i. ØA – Black
 - ii. ØB – Red
 - iii. ØC – Blue
 - iv. Neutral – White
 - v. Ground – Green
 - b. 277/480V-3Ø:
 - i. ØA – Brown
 - ii. ØB – Orange
 - iii. ØC – Yellow
 - iv. Neutral – Gray
 - v. Ground – Green.
- D. Parallel Conductors: Specify that parallel conductor feeders be installed so that all runs are of identical equal length.
- E. Wire Pulling:
 - 1. Require all conductors to be pulled into conduit at the same time.
 - 2. Specify UL-listed wire pulling lubricant.
 - 3. Require conduits to be swabbed clean before wire is pulled.
 - 4. Length of conductors at receptacles, junction, and switches: at least 6" of free conductor shall be left at each outlet, junction and switch for splices or connection of fixtures or devices. Comply with NEC Article 300.
 - 5. Install box connectors and bushings at points where wiring enters conduit, raceways, equipment or panels.
 - 6. All wires within multi-conductor wiring shall remain within the jacket except at splice points and terminations.
 - 7. No uncovered (out of jacket) conductor shall be exposed or run through conduit or raceways.
- F. Wiring Connections And Terminations:
 - 1. Specify that conductors may be spliced only in accessible junction boxes or wireways.
 - 2. Require that wires be thoroughly cleaned before installing lugs or connectors.
 - 3. Specify a grounding conductor(s) in all branch circuit raceways. Conduit shall not be used as a grounding conductor.
 - 4. For all new work, conduit shall not be used as a grounding conductor.

3.02 FIELD QUALITY CONTROL

- A. Prior to energizing, all feeders from transformers, switchboards, and building service cables, are to be tested with a 500-volt insulation megohm meter to determine insulation resistance levels to assure

SECTION 16120 – WIRE AND CABLE

requirements are fulfilled. All field test data is to be recorded and submitted to the DPS Project Manager. Test is to include meggering for one minute between conductors and between each conductor and ground. Cables are to be megered after insulation with cables disconnected at both ends. The value must not be less than as follows:

<u>Conductor Size (AWG or MCM)</u>	<u>Resistance (Megohms-1,000 ft)</u>
#16 AWG to #8 AWG	200
#6 awg to #2/o AWG	100
#3/0 AWG to 500 kcmi	150

3.03 REMODEL PROJECTS

A. Aluminum Wire and Cable:

1. Replace existing aluminum wires/cables with copper wires/cables. (Where funding is not available for the replacement, the aluminum wires/cables shall be documented to DPS Project Manager for future action.

B. Existing Feeders:

1. Where existing feeders are not planned for replacement, contractor shall perform a one (1) minute, 500VDC meggar test to check the integrity of the insulation. Record test results and submit to DPS Project Manager for record purposes.

END OF SECTION 16120

PART 1 GENERAL

1.01 REFERENCES

- A. Where appropriate, refer to current ANSI and NEMA standards.
- B. National Electrical Code (NEC) (current edition).

1.02 SUBMITTALS

- A. Operation and Maintenance Manuals. Provide minimum: General description and technical data.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Sheet Metal Outlet Boxes: Galvanized steel, 4" square minimum with a 2-1/8" box depth minimum. Provide single or double plaster ring as required.
- B. Cast Boxes: Cast ferroalloy, deep type with gasketed cover, threaded hubs.
- C. Floor Boxes For Cast-In-Place Concrete Floors:
 - 1. Prohibited without written approval from DPS Project Manager.
 - 2. Fully adjustable, cast iron or formed galvanized steel.
 - 3. Box specifics shall be coordinated with project requirements.
 - 4. Front face shall be perpendicular to the floor to prevent entrance of liquids and debris.
- D. Sheet Metal Boxes:
 - 1. Galvanized steel.
 - 2. Sheet metal boxes less than 12" in any one dimension shall comply with Section 16160, 2.01.A.1.
 - 3. Sheet metal boxes over 12" in any one dimension shall comply with requirements of Section 16160, 2.01.B.1.

2.02 BOX EXTENSIONS

- A. Prohibited in new construction and additions.
- B. One extension is permitted on remodel work to extend existing installations. Where more than one box is needed to flush out installation, provide a large (i.e. 6" x 6" minimum) box to flush out the existing box and nipple over to a new box.

2.03 IDENTIFICATION AND TAGGING

- A. Comply with Section 16195 – Electrical Identification.
- B. All junction boxes shall have labeling on the cover to indicate circuits contained within.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Box Locations:
 - 1. Require electrical boxes to accommodate wire pulling, splices, taps, equipment connections and code compliance.
 - 2. Coordinate access doors as required to provide access to boxes in hard ceilings and similar inaccessible areas.

SECTION 16130 – BOXES

3. Provide cast box (with threaded hubs) in high traffic areas (surface installations), as specified by owner.

B. Outlet Box Installations:

1. Back-to-back outlet boxes are not permitted. Separate boxes a minimum of 6" in standard walls and a minimum of two (2) feet in acoustical or fire-rated walls.
2. Provide knockout closures for unused openings.
3. Specify that blank cover plates be used on all unused boxes.
4. For multiple device installations, specify multi-gang boxes. Sectional boxes are not permitted. Require barrier separation of different voltage conductors in the same box.
5. Thoroughly coordinate casework and backsplash heights with mounting heights of boxes.
6. Specify recessed outlet boxes in finished areas, supported from interior partition studs. Supports are to be stamped steel stud bridges for hollow stud walls, and adjustable steel channel fasteners for flush ceiling outlet boxes.
7. Provide back supports for boxes in metal stud walls.
8. Locate boxes in masonry walls to require cutting of masonry unit edge only.

C. Pull and Junction Box Installations:

1. Wherever possible, locate pull and junction boxes above accessible ceilings in finished areas.
2. Specify that pull or junction boxes shall be supported independently of conduit.
3. In flush grade outdoor applications, unit shall be adequately supported against settling or tipping. Where heavy traffic or poor soil compaction exists, cast box in a concrete base which provides 6" of cover around the box.

END OF SECTION 16130

SECTION 16140 – WALL SWITCHES

PART 1 GENERAL

1.01 GENERAL CONDITIONS:

- A. Switches shall be furnished and installed as called for on the drawings and/or specified herein.
- B. Device plates shall be provided for all devices and boxes and be suitable for the device or devices installed.
- C. Contractor to provide full shop drawings for review and approval and also include this system in the O & M Manuals.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Wall switches, receptacles and plates shall be of the same manufacturer insofar as possible.
- B. Wall switches shall be manufactured by:
 - 1. Hubbell
 - 2. Leviton
 - 3. Arrow-Hart
 - 4. Eagle
 - 5. Pass & Seymour
- C. Products shall comply with Federal Specification W-S-896E.

2.02 MATERIALS

- A. 120/277-volt wall switches shall be industrial grade rated 20 amperes and shall be quiet, quick-make, quick-break with toggle handle, and totally enclosed case. Other ampere switches may only be used with DPS Project Manager permission.
- B. Two-pole, three-way and four-way switches shall be of the same construction. C. Key-operated switches shall be Hubbell as above with locking-type mechanism.
- C. Switches with pilot light shall be the same as above, except that switches shall be equipped with and connected to an integral pilot light.
- D. Switches shall be in accordance with the following schedule. All numbers referenced are Hubbell–Bryant Catalog numbers
 - 1. Single-pole switch: 4901-I.
 - 2. Single-pole switch with pilot light (120 V - load on): 4901-PLC120.
 - 3. Two-pole switch: 4902-I.
 - 4. Three-way switch: 4903-I.
 - 5. Four-way switch: 4904-I.
 - 6. Position switch (momentary contact): 4821.
 - 7. Position switch (momentary contact, locking): 4821-L with #6006 key.
 - 8. Single-pole switch (locking): 4901-L.
 - 9. Two-pole switch (locking): 4902-L.
 - 10. Three-way switch (locking): 4903-L.
 - 11. Four-way switch (locking): 4904-L.
 - 12. Single-pole switch with pilot light (277V - load on): 4902-PL277.

SECTION 16140 – WALL SWITCHES

13. Three-position switch (maintained contact): 4922.

14. Three-position switch (maintained contact): 4925-L with #6006 key.

- E. Switch color to be ivory unless otherwise specified. Verify color with architect prior to ordering.
- F. Switch for life safety circuits shall be red.
- G. Grounding screw on all devices.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Switches shall be arranged singularly or in gangs, and within 18" of the door jamb on the strike side of the door openings. Verify the door swings with the architectural drawings prior to rough-in.
- B. Install life safety system switches separately from normal power switches. Do not include in the multiple-gang configuration.
- C. Switch and receptacle combinations shall be as above in a two-gang box where both are of the same voltage. Provide separate boxes where different voltages are present.
- D. All switches in mechanical rooms, electrical rooms and other such places shall be a lighted-handle, single-pole light switch(es) as required.
- E. Provide circuit and panelboard identification on outside of all switch plates per Section 16195.

END OF SECTION 16140

SECTION 16141 – RECEPTACLES

PART 1 GENERAL

1.01 GENERAL CONDITIONS:

- A. Receptacles shall be furnished and installed as called for on the drawings and/or specified herein.
- B. Device plates shall be provided for all devices and boxes and be suitable for the device or devices installed.
- C. Contractor to provide full shop drawings for review and approval and also include this system in the O & M Manuals.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Wall switches, receptacles and plates shall be of same manufacturer insofar as possible.
- B. Receptacles shall be manufactured by:
 - 1. Hubbell
 - 2. General Electric
 - 3. Leviton
 - 4. Arrow-Hart
 - 5. Eagle
 - 6. Pass & Seymour

2.02 MATERIALS

- A. Materials shall comply with Federal Specification W-C-596E.
- B. Receptacles shall be heavy-duty industrial-grade and shall be of the grounding type. Provide grounding screw.
- C. Receptacles shall be in accordance with the following schedule. All numbers referenced are Hubbell –Bryant Catalog numbers.
 - 1. Duplex receptacle, 20A, 125V: 5362.
 - 2. Duplex receptacle, 20A, 125V, isolated ground: 5362-IG.
 - 3. Duplex receptacle, 20A, 125V, ground fault: GFR53FT-I.
 - 4. Single receptacle, 50A, 250V, locking: CS6369A or CS6369N.
 - 5. Single receptacle, 30A, 125V, ground fault: 9530-IG.
 - 6. Single receptacle, 20A, 125V: 5361.
 - 7. Single receptacle, 60A, 250V: 9460-FR.
 - 8. Single receptacle, 30A, 125V: 9530-FR.
 - 9. Single receptacle, 30A, 125/250V: 9430-FR.
 - 10. Single receptacle, 30A, 250V: 9630-FR.
 - 11. Single receptacle, 50A, 250V: 9650-FR.
 - 12. Single receptacle, 50A, 125/250V: 9450-FR.
- D. Device color to be ivory unless otherwise specified. Verify color with architect prior to ordering.
- E. Device color for life safety circuits shall be red.

SECTION 16141 – RECEPTACLES

- F. Isolated ground receptacles shall be marked with an orange triangle or shall be orange in color.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Over-counter devices shall be horizontally-mounted, ground to the left.
- B. Switch and receptacle combinations shall comply with Section 16141.
- C. Where convenience outlets or similar devices are installed within one stud-spacing width from a switch, the convenience outlet and switch shall align vertically.
- D. Provide separate green ground wire for all isolated ground receptacles.
- E. Provide hospital safety-grade receptacles in all ECE and kindergarten areas of elementary schools.
- F. Provide heavy-duty industrial-grade receptacles in all areas.
- G. Vertical-mounted receptacles to be installed with the ground side down.
- H. Provide circuit and panelboard identification on the outside of all receptacle plates per Section 16195.

END OF SECTION 16141

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Device plates and outlet box covers

1.02 SUBMITTALS

- A. Product data: finishes and colors.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Wall switches, receptacles and device plates shall be by same manufacturer as devices.
 - 1. Hubbell
 - 2. Daniel Woodhead
 - 3. Leviton
 - 4. Arrow-Hart
 - 5. Eagle
 - 6. P & S

2.02 MATERIALS

- A. Smooth Metal: Stainless steel in all locations unless otherwise directed.
- B. Smooth Lexan: Only as approved by DPS Project Manager.
- C. Steel, finish to be painted, color to be ivory unless otherwise noted.
- D. Cast Metal or Aluminum: Die-cast profile, ribbed for strength, flash removed, primed with gray enamel.
- E. Gaskets: resilient rubber or closed-cell foam urethane.
- F. Weatherproof: Cast metal or aluminum, gasketed; provide spring-loaded gasketed covers. All devices in areas subject to frequent use shall be "in-use" type of covers.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install device plates for all outlet boxes and including empty outlet boxes.
- B. All light switch device plates in classrooms shall be labeled with circuit and panel identification on the lights controlled. Light switches shall be labeled as to lights controlled. Receptacles shall be labeled with source circuit. All other device plates shall be labeled per direction in Sections 16140, 16141, and 16195.

END OF SECTION 16142

SECTION 16190 – SUPPORTING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. All materials and equipment shall be installed in accordance with recommendations of the manufacturer as approved by the Architect, to conform with the Contract Documents. The installation shall be accomplished by workmen skilled in this type of work.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Support Channels:
 - 1. Galvanized or painted steel for non-corrosive environment.
- B. Hardware:
 - 1. Corrosion resistant.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Anchors:
 - 1. Fasten hanger rods, conduit clamps, outlet and junction boxes to building structure using precast insert system, preset inserts or beam clamps.
 - 2. In precast structures, use precast inserts wherever possible.
 - 3. In hollow masonry, plaster, or gypsum board partitions and walls, use toggle bolts or hollow wall fasteners.
 - 4. In solid masonry walls, use expansion anchors or preset inserts with removable screws or bolts.
 - 5. In cast-in-place concrete, use expansion anchors, preset inserts or self-drilling masonry anchors with removable screws or bolts.
 - 6. In sheet metal studs, use sheet metal screws.
 - 7. Attachment of electrical supports to piping, ductwork, mechanical equipment or conduit is not allowed.
 - 8. Drilling of structural steel members is prohibited.
 - 9. Plastic, fiber, or powder activated anchors are prohibited in any type of construction.
 - 10. Attachment to ceiling suspension wires is prohibited.
 - 11. The use of wire for supporting conduits will not be permitted. Independent support wires will be permitted for use as a fixture support where applicable.
 - 12. Concrete anchors shall not be used to suspend heavy electrical loads such as panelboards or conduits 4" and larger.
 - 13. Anchors shall be sized to support conduits when full fitted to maximum capacity with cables.
 - 14. One-time expansion anchors are not allowed.
- B. Supports:
 - 1. Require that supports be fabricated from structural steel, steel channel or unistrut, rigidly bolted or welded to present a neat appearance.
 - 2. Install free-standing electrical equipment on 4" concrete housekeeping pads.

SECTION 16190 – SUPPORTING DEVICES

3. Require that surface mounted cabinets, enclosures and panelboards be supported with a minimum of four anchors. On exterior concrete walls below grade and all other areas subject to moisture, provide 1" steel channel stand-offs for cabinets and raceways.
4. Use bridge studs at top and bottom with channels to support cabinets and enclosures which are flush mounted in hollow walls.
5. Specify suitable vibration insulation pads for vibrating equipment such as transformers.
6. No suspended conduit or box supports shall be less than 1/4" diameter steel rod. Rod used as pedestal support is not acceptable.

END OF SECTION 16190

PART 1 GENERAL

1.01 GENERAL CONDITIONS:

Major items of electrical equipment and major components shall be permanently marked with an identification nameplate to identify the equipment by type or function and specific unit number if shown on the drawing. The items under this section of the specifications do not have to be submitted for approval and/or include in the O & M Manuals.

PART 2 PRODUCTS

2.01 MATERIALS

A. Nameplates:

1. Engraved three-layer laminated plastic, black letters on white background.
2. Life safety and emergency shall be white letters on red background.
3. Grounds shall be green letters on white background.
4. Thickness 1/16" for units up to 20 square inches or 8 inches in length; 1/8" thick for larger nameplates.
5. Fasteners: Minimum 2 self-tapping stainless steel screws.

B. Electronic Labels:

1. Manufacturers
 - a) Kroy
 - b) Brother

C. Wire and Cable Markers:

1. For cables smaller than #2/0, standard vinyl-cloth self-adhesive cable/conductor markers of wrap-around type, either prenumbered plastic coated type, or write-on type with clear plastic self-adhesive cover flap are to be used.
2. For cables #2/0 and larger, heat shrink sleeving is to be used for phase color coding.

D. Embossed labels are prohibited.

PART 3 EXECUTION

3.01 INSTALLATION

A. Nameplates and Labels:

1. Specify the following:
 - a) Degrease and clean surfaces to receive nameplates and labels.
 - b) Install nameplates parallel to equipment lines.
 - c) Secure nameplates to equipment using minimum two screws or rivets. Locate nameplates on outside face of panelboard doors in finished locations.
 - d) Electronic labels will be permitted only for identification of individual wall switches (in unfinished areas), and on outside face of receptacles and wall switch plates.

B. Wire Identification:

SECTION 16195 – ELECTRICAL IDENTIFICATION

1. Provide wire markers on each conductor at points of termination in panelboards, outlet and junction boxes, at load connections, and internally to cabinets and enclosures with electrical components. Identify with branch circuit or feeder number for power and lighting circuits, and with control circuit number for control wiring.

C. Junction and Pull Box Identification:

1. On the cover of each junction box and pull box: the circuit number(s) of the enclosed conductors are to be legibly written with a black permanent ink broad tip marking pen and the system identification.
2. Paint covers for emergency and fire alarm system red.

3.02 NAMEPLATE ENGRAVING SCHEDULE

- A. For engraving, identification shall be the name of the device, panelboard, etc. The “voltage, load serve” line also shall include the name of the feeding panel, switchboard, etc.

B. Panelboards, Cabinets, and Enclosures:

1. Identification: ½”-high lettering.
2. Voltage: ¼”-high lettering.

C. Transformers:

1. Identification: ½”-high lettering.
2. Voltage, source: ¼”-high lettering.

D. Switches and Receptacles:

1. Identification: electronic tape or neatly-written permanent ink on inside faceplate in finished areas.

E. Interior Cabinet and Enclosure Electrical Components:

1. Identification: ½”-high lettering.
2. Voltage, source: ¼”-high lettering.

F. Disconnects Starters, and Control Stations:

1. Identification: 3/16”-high lettering.
2. Voltage, source: 3/16”-high lettering.

3.03 PULL AND JUNCTION BOX COLOR-CODING

- A. For ease of identification during maintenance and remodeling, junction box covers shall be color-coded according to the following schedule:

1. Fire alarm: red
2. Emergency circuitry: yellow
3. Telephone: green
4. Television: violet
5. Computer data: blue
6. 277/480V system: orange
7. Clock System: pink

END OF SECTION 16195

SECTION 16440 – DISCONNECTED SWITCHES

PART 1 GENERAL

- A. Each motor or piece of equipment so indicated on the drawings shall be provided with a disconnecting means under this section of the specifications when required by the N.E.C. even though not indicated on the drawings. Contractor to provide full shop drawings for review and approval. These items do not have to appear in the O & M Manuals.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Disconnect Switches:
 - i. General Electric
 - ii. Westinghouse/Cutler Hammer
 - iii. ITE/Siemens
 - iv. Square D

2.02 MATERIALS

- A. Disconnect Switches:
 - 1. Fusible Switch Assemblies (NEMA KS-1):
 - i. Heavy duty rated, quick-make, quick-break and load interrupter enclosed knife switch, with externally operable handle with override screw to permit opening front cover with switch in "ON" position. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock. Handle lockable in "OFF" position. Class R rejection fuse clips, designed to accommodate required fuses; copper lugs; hinged cover.
 - 2. Non-Fusible Switch Assemblies (NEMA-KS-1):
 - ii. Heavy duty rated, quick-make, quick-break and load interrupter enclosed knife switch, with externally operable handle with override screw to permit opening front cover with switch in "ON" position. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock. Handle lockable in "OFF" position; copper lugs; hinged cover.
 - 3. Enclosures:
 - iii. Suitable for environment in which installed. Prefer Type 1 indoors and Type 3R outdoors.

2.03 IDENTIFICATION AND TAGGING

- A. Provide nameplate on cover per Section 16195 – Electrical Identification.

PART 3 EXECUTION No standards

END OF SECTION 16440

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SECTION 16501 – LAMPS

PART 1 GENERAL

1.01 GENERAL CONDITIONS:

- A. Provide new lamp(s) with each lighting fixture. Lamp types and quantities for each fixture are specified with the fixture type description in the "Project Luminaire Schedule".
- B. Submit shop drawings for review. Shop drawings shall include project type designation, manufacturer, and catalog number for each fixture proposed for use. Also include this system in the O & M Manuals

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Fluorescent Lamps:
 - 1. Philips
 - 2. OSRAM/Sylvania
 - 3. General Electric
- B. HID Lamps:
 - 1. OSRAM/Sylvania
 - 2. General Electric
 - 3. Philips
 - 4. Venture
- C. Incandescent Lamps:
 - 1. General Electric
 - 2. OSRAM/Sylvania
 - 3. Philips
 - 4. Ushio

2.02 MATERIALS

- A. Indoor Fluorescent Lamps:
 - 1. Fluorescent lamps shall be T-8 F32 or T5HO with 4,100 degree K color only and with a color-rendering index (CRI) of 73 or greater. Standard nominal lamp length is 4'-0". Other lengths of lamps may be specified if special conditions require them and with written approval from DPS Project Manager prior to bid.
 - 2. The use of T-8 or T5HO lamps is required in all new luminaires.
 - 3. Compact fluorescent lamps shall be four pin triple tube.
- B. Outdoor Fluorescent Lamps:
 - 1. High output, cool white, lengths as required.
- C. HID Lamps:
 - 1. Use Super Metal Halide 175 watt or 400 watt mogul base, position-orientated lamps for all exterior lighting. Pulse start metal halide may be utilized where cost effective.

SECTION 16501 – LAMPS

- D. Incandescent Lamps:
1. A style, inside frosted, 130 Volt.
 2. Use Tungsten Halogen PAR lamps for higher efficiency and longer life. Use “T” type when high output incandescent is needed.
 3. Use low voltage MR-16 lamps where longer life is required by utilizing a lamp with a life of 4000 hours or greater.
 4. Incandescent lamps may only be used with written approval of the DPS Project Manager prior to bid.

PART 3 EXECUTION

3.01 ADJUSTING

- A. Require group relamping of ceramic metal halide lamps to replace lamps when color shift is noticeable.

3.02 SPARE PARTS AND TOOLS

- A. Replace non-functional lamps at time of final acceptance and provide 10 percent spare lamps for each lamp type on project.

END OF SECTION 16501

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data:

1. Submit manufacturer's product data and installation instructions on each type of interior building lighting fixture and component as listed on drawing schedules. Submit fixture product data and drawings in booklet form with separate sheet for each fixture. Mark identifying listing on product data sheets as on schedules, assemble in alphabetical or numerical order by luminaire-type with fixture, accessories and complete catalog number clearly indicated on each sheet. Submit details indicating compatibility with wiring and mounting methods and with suspended ceiling grid systems employed for the installations.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Exit Signs:

1. Exitronics
2. Hubbell
3. Isolite

B. Egress/Emergency Lights:

1. Dual Light Spectron
2. Prescolite CVS
3. Siltron Continuous Diagnostic

C. Fluorescent Ballasts (compatible with T-8 lamps)

2.02 EQUIPMENT

A. Fluorescent Luminaires:

1. Provide with hinged frames with latches, pre-wired with trim and accessories as required for ceiling system into which luminaire is mounted. Doors may be hinged from either side and shall be gasketed to prevent light leaks.
2. Recessed fluorescent fixtures to be equipped with 6' long flexible whip for connection to a junction box.
3. Acrylic lenses shall have a minimum 0.125-inch thickness.

B. Incandescent Luminaires:

1. May only be used with written approval from DPS Project Manager prior to bid.
2. Pre-wired with lens and reflector retainer clips and mounting accessories.
3. Recessed fixtures to be equipped with thermal protection and labeled per NEC as thermally protected.

C. Exit Signs: Light-emitting diode (LED), low wattage type with long life, maintenance-free battery requiring programmed discharge under load, self-testing and self-diagnostics. Provide green letters on white background.

D. Egress/Emergency Lights:

1. Self-testing (the unit shall perform battery tests in accordance with NFPA), self-diagnostic (the unit shall perform self-diagnostics and indicate problems discovered via LEDs). Utilize only where meets 1fc requirement.

E. HID Luminaires:

SECTION 16510 – LUMINAIRES

1. Pre-wired with integral ballast. Where required by lamp failure, provide with protective lens to retain lamp particles in the event of non-passive lamp failure.
2. Provide, where necessary, tungsten halogen lamp for instant light in the event of a momentary power outage, or utilize a Bodine “ARC Keeper” HID Backup ballast for 175W and 250W MH lamps.

PART 3 EXECUTION

- A. Require safety chains on HID luminaries, i.e., gyms, cafeterias, etc.

END OF SECTION 16510

SECTION 16721 – FIRE ALARM SYSTEM

PART 1 GENERAL:

1.01 INSTALLER QUALIFICATION/CERTIFICATION

- A. The Fire Detection Contractor shall have at least five (5) years experience in designing and installing fire alarm systems, with at least three (3) systems greater than two hundred thousand (200,000) square feet in the City and County of Denver within the last two (2) years.
- B. The Fire Detection Contractor shall directly employ NICET (minimum Level-II Fire Alarm Technology) technicians to guide the final checkout and to ensure system integrity.
- C. The Fire Detection Contractor shall employ a Journeyman Electrician for all electrical work. Electricians must have a Denver Fire Alarm Systems License.

1.02 SUBMITTALS

- A. Certification: Submit certification from the major equipment manufacturer indicating that the distributor is an authorized Distributor and/or Installer for the equipment.
- B. Shop drawing submittal to AHJ(s): When the shop drawings are submitted to the AHJ(s) for review for a permit, the System Design Engineer shall be responsible to ensure that a third set of the fire alarm engineering drawings are submitted. The AHJ(s) will return this third set to the System Design Engineer, which shall be returned to DPS as the approved record submittal and must include the AHJ(s) comments.
- C. Shop Drawings:
 - 1. System Design Engineer shall submit shop drawings for review to the Architect, DPS Project Manager, and DPS QA/QC before being submitted to the AHJ(s) for permit review. Shop drawings shall include the following:
 - a) Shop drawings shall be produced in AutoCAD-2011 or compatible version.
 - b) Architectural floor plans (scale as depicted on contract documents) showing location of FACP, annunciator, alarm initiating devices, alarm notification appliances, sources of electric power including electrical circuits used for FACP, interface, power supplies.
 - c) Architectural reflected ceiling plans showing ceiling height changes, soffits, coffers, supply and return air vents and light fixtures, etc.
 - d) Equipment layout and device arrangement.
 - e) Complete point-to-point wiring diagrams detailing internal and interconnecting wiring for power, signal and control that distinguishes between field installed and factory installed wiring.
 - f) Fire alarm symbols shall match the current International Fire Code Symbols and the City and County of Denver "Graphic Wall Map Symbols".
 - g) FACP cabinet layout.
 - h) Remote supervising station connection.
 - i) Graphic annunciator detail shall be submitted at actual size and depict the following:
 - i) Architectural floor plan (black)
 - ii) room numbers (blue)
 - iii) fire alarm initiating devices (red) with custom message number
 - iv) FACP (red)
 - v) graphic annunciator location with "YOU ARE HERE" arrow (red)
 - vi) north arrow (black)
 - vii) legend (black)

SECTION 16721 – FIRE ALARM SYSTEM

- viii) site plan with street names (black)
 - ix) locations of hydrants, fire department connection and DFD transmitter (red)
 - x) Locations of main shutoffs for gas, water, electric, and fire sprinkler, etc. (red)
 - xi) No Fire Detection Contractor logo's allowed on graphic panels.
 - j) Standby battery calculations.
 - k) Voltage drop calculations for horn and visual devices.
 - l) Sequence of operation (Manufacturer's standard descriptions for generic systems are not acceptable).
 - m) Riser diagrams:
 - i) Typical riser diagrams are not acceptable.
 - ii) The riser diagram shall be specific to each building and include exact quantities of notification appliances.
 - iii) Show each circuit emanating from the control panel, auxiliary equipment such as printers, and every device on the system.
 - iv) Devices shall be shown located on the circuits they are connected to, in the same relation as shown on the floor plan.
 - n) Wire list including FACP manufacturer's recommended wire, size and color-coding.
 - o) 3:1 scaled elevation drawing of network graphical user interface station placement and layout of all equipment required therein.
 - p) Elevation drawings of walls on which control panels, interface panel, transmitter and annunciator panels are to be mounted. Elevations shall be fully dimensioned to show location of each piece of equipment.
- D. Product data: Specifications and highlighted cut sheets on each piece of equipment proposed. Include manufacturer's name(s), model numbers, ratings, power requirements.
- E. As-builts: Submit as-built shop drawings to the Architect (if applicable) or System Design Engineer for incorporation into the project as-builts.
- F. Operation and Maintenance data:
- 1. List manufacturers.
 - 2. Include technical data sheets.
 - 3. Wiring diagrams indicating internal wiring for each device and the interconnections between items of equipment.
 - 4. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.
- G. Tools for program modification, including addition and deletion of devices, circuits, zones and changes to system operation, and custom label changes for devices or zones:
- 1. Provide hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. If more than one installing company is qualified to install the equipment, make provisions that any company can modify the system.
 - 2. Provide software documentation that details procedures and precautions required for software modification.

PART 2 PRODUCTS

2.01 MATERIAL AND EQUIPMENT, GENERAL

SECTION 16721 – FIRE ALARM SYSTEM

8. Automatically compensate the sensitivity level of smoke sensors for dusty or dirty conditions.
9. A minimum of seven sensitivity levels for alarm, selected by detector. Range of 1 to 2.35% per foot for photoelectric detectors.
10. Pre-alarm, selected by detector, to indicate impending alarms to maintenance personnel.
11. Alarm verification, with counters and a trouble indication to alert maintenance personnel when a detector enters verification twenty (20) times. (Alarm verification shall be enabled or disabled for initial installation per Denver Fire Department instructions.)
12. PAS presignal, meeting NFPA-72 3-8.3 requirements.
13. Rapid manual station reporting (under three (3) seconds).
14. Non-alarm points for general (non-fire) control.
15. Periodic detector test, conducted automatically by the software.
16. Self-optimizing pre-alarm for advanced fire warning, which allows each detector to learn its particular environment and set its pre-alarm level to just above normal peaks.
17. Cross zoning with the capability of counting: two (2) detectors in alarm, two (2) software zones in alarm, or one (1) smoke detector and one (1) thermal detector.
18. Walk test, with a check for two detectors set to same address.
19. Control-by-time for non-fire operations, with holiday schedules.
20. Day/night automatic adjustment of detector sensitivity.
21. UL-1076 security monitor points.
22. Provide 25% spare capacity on each card(s).
23. Provide 25% capacity on each circuit(s) and for panel points, considering both circuit and panel limitation. This includes device count, circuit length, voltage drop, and panel capacity.
24. Balance circuits for equal loading and spare capacity.
25. Provide an eight (8) point relay card in the FACP and program the FACP to send discrete signals to the DFD transmitter.
26. Capability to cancel, through software modification, the detector polling light during normal operation of the system.
27. Provide the ability to log, display and print system reports:
 - a) Real time and date shall accompany history event recording.
 - b) Provide an integrated printer that prints out a hard copy indicating each device in alarm and/or in "trouble" state. If the printer is not integrated, the Contractor shall provide and install a shelf with an enclosure for the printer and paper rack.
 - c) The descriptor at the FACP and printer shall clearly indicate the location of each alarm-initiating device. The descriptor shall contain the general area, the specific area, the room, the room number, and the device. Example - CLASSROOM 301, SMOKE DETECTOR, DEVICE NUMBER L1- D102.
28. Allow for loading and editing of special instructions and operating sequences.
29. Provide capability for on-site programming.
30. Provide means of minor programming changes by DPS personnel.
31. The backup software programming shall be stored on a DPS - 2GB USB Smart Stick. Prior to completing any Fire Detection System Updates, Upgrades, Modifications, or Additions, the Contractor must complete the following:

SECTION 16721 – FIRE ALARM SYSTEM

- a) The Contractor must checkout the current Fire Detection System Backup Software Program Smart Stick from the DPS Electrical Shop Supervisor, located at 2800 W. 7th Avenue, Denver, CO. The DPS – 2GB USB Smart Stick will only contain the current AHJ/DPS approved program.
 - b) After completing the Contract Scope of Work, the Contractor must backup the updated Fire Detection Software Programming to the 2 GB USB Smart Stick. The DPS – 2GB USB Smart Stick will only contain the updated program.
 - c) The Contractor must return the updated Fire Detection System Backup Software Program Smart Stick to the DPS Electric Shop Supervisor (located at 2800 W. 7th Avenue, Denver, CO) two (2) days after the AHJ Acceptance Testing.
32. The system structure and software shall place no limit on the type or extent of software modifications on-site.
33. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made.
34. If allowed by the Authorities Having Jurisdiction (AHJ), the system shall have an alarm verification feature that can be set by individual sensor or for a group of sensors:
- a) Verification time adjustable from zero (0) to sixty (60) SECONDS.
 - b) Alarm verification set at thirty (30) seconds.
 - c) Special conditions may dictate that specific detectors have a different verification period.
35. Smoke density sensors and heat (temperature) sensors:
- a) The control panel shall determine if an alarm condition exists by comparing the sensor value to stored values.
 - b) If allowed by the AHJ, the alarm point shall be adjustable manually or automatically from the control panel.
 - c) Program to set the sensitivity to the lowest level during school hours and then reset to a higher sensitivity when the building is unoccupied.
- G. Signals and transmission:
1. Automatically transmit a coded signal to the Denver Fire Alarm Headquarters through an AES radio transmitter box:
 - a) Trouble and supervisory alarms are to be transmitted to the Denver Fire Alarm Headquarters. When activated, they shall sound and the yellow trouble LED on the FACP shall be illuminated.
 - b) It shall not be possible to disable the radio transmitter (AES) for testing and maintenance purposes.
 - c) The system shall transmit to the radio transmitter (AES) those alarms, troubles and supervisory as required by the AHJ.
 - i) The drowning alarm shall transmit a different sound (not temporal pattern) in the pool area only, not as a general alarm throughout the building.
 - d) Special systems such as kitchen hoods, fire pump running, etc. shall be transmitted as separate alarms.
 - e) The radio transmitter (AES) is limited to eight (8) zones. If more than eight (8) zones are required, additional transmitters shall also be provided.
 2. Each device will be programmed to report to one (1) of the transmitter zones. Duct Detector, Supervisory, and Trouble alarms shall be transmitted to Denver Fire Department Dispatch.
 3. The outside horn/strobe at the Fire Department Connection (FDC) shall be activated by a water flow alarm only.

SECTION 16721 – FIRE ALARM SYSTEM

H. Operator control:

1. Acknowledge Switch: Activation of the FACP 'Acknowledge Switch' in response to new alarms and/or troubles/supervisories shall silence the FACP signal and change the alarm and trouble LEDs from flashing mode to steady-ON mode. If multiple alarm or trouble or supervisory conditions exist, depression of this switch shall advance the eighty (80) character LCD display to the next alarm, trouble or supervisory condition. Depression of the Acknowledge switch shall also silence all remote annunciator sounders.
2. Alarm Silence Switch: Activation of the "Alarm Silence" switch shall cause all programmed alarm notification appliances (horns) and relays to return to the normal condition during an alarm condition. The selection of notification circuits and relays that are silenceable by this switch shall be fully field programmable within the confines of all applicable standards. The FACP software shall include silence inhibit and auto-silence timers.
3. System Reset Switch: Activation of the "System Reset" switch shall cause all electronically-latched initiating devices, appliances or software zones, as well as all associated output devices and circuits, to return to their normal condition.
4. Lamp Test Switch: The Lamp Test switch shall activate all system LEDs and light each segment of the liquid crystal display.

I. Central microprocessor:

1. The microprocessor shall be a state-of-the-art, high speed, device and it shall communicate with, monitor and control all external interfaces.
2. Include an EPROM for system program storage, non-volatile memory for building-specific program storage, and a watchdog timer circuit to detect and report microprocessor failure.
3. Contain and execute all control-by-event programs for specific action to be taken if an alarm condition is detected by the system. Control-by-event equations shall be held in non-volatile programmable memory, and shall not be lost even if system primary and secondary power failure occurs.
4. The microprocessor shall also provide a real-time clock for time annotation of system displays, printer, and history file. The time-of-day and date shall not be lost if system primary and secondary power supplies fail. The real time clock may also be used to control non-fire functions at programmed time-of-day, day-of-week, and day-of-year.
5. A special program check function shall be provided to detect common operator errors.

J. Display:

1. Provide the controls and indicators used by the system operator and also be used to program system operational parameters.
2. Include status information and custom alphanumeric labels for intelligent detectors, addressable modules, internal panel circuits, and software zones.
3. Include an 80-character backlit alphanumeric Liquid Crystal Display (LCD). It shall also provide eight (8) Light-Emitting-Diodes (LEDs), that indicate the status of the following system parameters: AC POWER, FIRE ALARM, PRE-ALARM WARNING, SUPERVISORY SIGNAL, SYSTEM TROUBLE, DISABLED POINTS and ALARM SILENCED.
4. Include the following operator control switches: ACKNOWLEDGE, ALARM SILENCE, SYSTEM RESET and LAMP TEST.
5. The system shall support an optional battery ammeter/voltmeter display.

K. Signaling Line Circuits (SLC):

1. Each Signaling Line Circuits (SLC) interface shall provide power to, and communicate with, intelligent detectors (flame, photoelectric or thermal) and intelligent modules (monitor or control).

SECTION 16721 – FIRE ALARM SYSTEM

L. The Loop Interface Board (LIB):

1. The Loop Interface Board (LIB) shall receive analog information from all intelligent detectors to be processed to determine whether normal, alarm, pre-alarm, supervisory or trouble conditions exist for each detector. The software shall automatically maintain the detector's desired sensitivity level by adjusting for the effects of environmental factors, including the accumulation of dust in each detector. The analog information shall also be used for automatic detector testing and for the automatic determination of detector maintenance requirements:
 - a) The detector software shall meet NFPA-72, Chapter-7 requirements and be certified by UL as a calibrated sensitivity test instrument.
 - b) The detector software shall allow manual or automatic sensitivity adjustment.

M. Serial Interfaces:

1. Include serial EIA-232 interfaces. Each interface shall be a means of connecting UL listed Electronic Data Processing (EDP) peripherals.

N. Notification Appliance Circuit (NAC) Module:

1. The NAC module shall provide fully supervised Class B (NFPA Style Y) notification circuits.
2. An expansion circuit board shall allow expansion to 8-circuits per module.
3. The module shall not affect other module circuits in any way during a short circuit condition.
4. The module shall also provide a momentary switch per circuit that may be used to manually turn the particular circuit on or off or to disable the circuit.
5. Each notification circuit shall include a custom label inserted to identify each circuit's location. Labels shall be created using a standard typewriter or word processor or computer printer.
6. Provide with removable wiring terminal blocks for ease of installation and service. The terminal strips shall be UL listed for use with up to 14-AWG wire.
7. Each circuit shall be capable of, through system programming, deactivating upon depression of the signal silence switch.

O. Control Relay Module:

1. The control relay module shall provide four Form-C auxiliary relay circuits rated at 2-amps, 28-VDC.
2. An expansion circuit board shall allow expansion to eight (8) Form-C relays per module.
3. Each relay circuit shall be capable of being activated (change in state) by any initiating device or from any combination of initiating devices.
4. The module shall provide a momentary switch per relay circuit that may be used to manually turn the relay ON/OFF or to disable the relay.
5. Each relay circuit shall include a custom label inserted to identify its location. Labels shall be created using a standard typewriter or word processor or computer printer. The Contractor shall provide all labels.
6. Provide with removable wiring terminal blocks for ease of installation and service. The terminal blocks shall be UL listed for use with up to 14-AWG wire.

P. FACP Enclosures:

1. The FACP shall be housed in an UL-listed cabinet for surface or semi-flush mounting.
2. The cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish. The Owner will select the color of the cabinet from choices provided by the equipment supplier.

SECTION 16721 – FIRE ALARM SYSTEM

3. The back box and door shall be constructed of 0.060-steel with provisions for electrical conduit connections into the sides and top.
 4. The door shall provide a key lock and shall include a glass or other transparent opening for viewing of all indicators.
- Q. Voice Command Center (VCC):
1. The Voice Command Center (VCC) shall contain equipment required for all audio control, telephone system control, signaling and supervisory functions.
 2. Include amplifiers, tone generators, digital voice units, a microphone and a main telephone handset. Provide a hand held microphone with priority push-to-talk switch.
 3. The voice command center shall be an integral part of the fire alarm system. Systems which require separate, non-integrated voice systems, are not considered suitable substitutes.
 4. Function:
 - a) Operate as a supervised dual channel emergency voice communication system.
 - b) Provide automatic custom digital recorded voice message and tone generation.
 - c) Provide an all-call switch and indicator to quickly activate all speaker circuits.
- R. Power Supply:
1. The main power supply shall operate on 120-VAC, 60-Hz, and shall provide all necessary power for the FACP. The FACP shall be connected to a separate dedicated branch circuit, maximum 20-amperes. This circuit shall be labeled at the main power distribution panel as FIRE ALARM. The branch circuit number, panel number and location shall be indicated inside the FACP panel.
 2. UL-listed with secondary power capable of operating the system, including the printer, as required by code.
 3. Provide minimum 6.0-amps of available power for the control panel and peripheral devices.
 4. Provide the ability to allow the audio-visual power to be increased as required by adding modular expansion audio-visual power supplies. The branch circuit number, panel number and location shall be indicated inside the FACP panel.
 5. Positive-Temperature-Coefficient (PTC) thermistors, circuit breakers, or other over-current protection shall be provided on power outputs.
 6. LED indicators:
 - a) Ground Fault LED.
 - b) Battery Fail LED.
 - c) AC Power Fail LED.
 7. Circuits shall be power-limited, per UL-864 requirements, latest edition.
 8. Provide a battery charger for 24-hours of standby using dual-rate charging techniques for fast battery recharge. If necessary to meet standby requirements, external battery and charger systems may be used.
- S. Batteries:
1. Sealed Gel Cell type, 12-Volt.
 2. Sufficient capacity to power the fire alarm system for not less than twenty four (24) hours plus five (5) minutes of alarm upon a normal AC power failure.
 3. Completely maintenance free. No liquids required. Fluid level checks for refilling, spills, and leakage shall not be required.

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4. In existing systems, where batteries can be re-used, replace all batteries where production dates are older than 2-years from completion date.
- T. Field Charging Power Supply (FCPS):
1. The FCPS is a device designed for use as either a remote 24-Volt power supply or used to power Notification Appliances.
 2. The FCPS shall offer up to 6.0-amps (4.0-amps continuous) of regulated 24-Volt power. It shall include an integral charger designed to charge two (2) 7.0-amp hour batteries and to support 60-hour standby.
 3. The FCPS shall have two input triggers. The input trigger shall be a Notification Appliance Circuit (from the FACP) or a relay. Four outputs (two style-Y or Z and two style-Y) shall be available for connection to the Notification devices.
 4. The FCPS shall include an attractive surface mount back box with key lockable door.
 5. The FCPS shall include the ability to delay the AC fail delay per NFPA requirements, latest edition.
 6. The FCPS include power limited circuitry, per latest UL standards.
- U. System Circuit Supervision:
1. Each FACP node shall supervise all circuits to intelligent devices, annunciators and peripheral equipment and annunciate loss of communications with these devices. The FACP CPU shall continuously scan the above devices for proper system operation and upon loss of response from a device shall flash a LED, sound an audible trouble, indicate which device or devices are not responding and print the information on the printer.
 2. Sprinkler system valves, standpipe control valves, Post Indicating Valve (PIV), and main gate valves shall be supervised for off-normal position.
 3. All notification circuits shall be supervised for open and short circuits.
- V. Audio Amplifiers:
1. The audio amplifiers will provide audio power for distribution to the speaker circuits.
 2. Multiple audio amplifiers may be mounted in the FACP using additional cabinets if necessary. Each FACP shall have a primary and a back-up amplifier.
 3. The audio amplifiers shall include an integral power supply, and shall provide the following controls and indicators:
 - a) Normal Audio Level LED.
 - b) Incorrect Audio Level LED.
 - c) Brownout LED.
 - d) Battery Trouble LED.
 - e) Amplifier Trouble LED.
 - f) Audio Amplifier Gain Adjust.
 4. Adjustment of the correct audio level for the amplifier shall not require any special tools or test equipment.
 5. Terminal blocks for the connection of field wiring shall have a removable plug-in and be hardwired to allow for ease of field wire installation in a cabinet or at a remote location.
 6. The amplifier shall include audio input and amplified output supervision, backup input, and automatic switchover to back up (if primary amplifier should fail).
- W. Specific System Operations:
1. Smoke Detector Sensitivity Adjust: A means shall be provided for adjusting the sensitivity of any or all

SECTION 16721 – FIRE ALARM SYSTEM

addressable intelligent detectors in the system from the system keypad. Sensitivity range shall be within the allowed UL window and have a minimum of seven (7) levels.

2. Alarm Verification: Each of the intelligent addressable smoke detectors in the system may be independently selected and enabled to be an alarm verified detector. The FACP shall keep a count of the number of times that each detector has entered the verification cycle. These counters may be displayed and reset by the proper operator commands.
 3. Point Disable: Any addressable device or conventional circuit in the system may be enabled or disabled through the system keypad.
 4. Point Read: The system shall be able to display or print the following point status diagnostic functions:
 - a) Device status.
 - b) Device type.
 - c) Custom device label.
 - d) View analog detector values.
 - e) Device zone assignments.
 - f) All program parameters.
 5. System Status Reports: Upon command from an operator of the system, a status report will be generated and printed, listing all system status.
 6. System History Recording and Reporting: The FACP shall contain a history buffer that will be capable of storing up to one thousand (1000) events. Up to two hundred (200) events shall be dedicated to alarm and the remaining events are general purpose. Each of these activations will be stored and time and date stamped with the actual time of the activation. The contents of the history buffer may be manually reviewed, one event at a time, or printed in its entirety. The history buffer shall use non-volatile memory. Systems that use volatile memory for history storage are not acceptable substitutes.
 7. Automatic Detector Maintenance Alert: The FACP shall automatically interrogate each intelligent detector and shall analyze the detector responses over a period of time. If any intelligent detector in the system responds with a reading that is above or below normal limits, then the system will enter the trouble mode, and the particular detector will be annunciated on the system display, and printed on the printer. This feature shall in no way inhibit the receipt of alarm conditions in the system, nor shall it require any special hardware, special tools or computer expertise to perform.
 8. The FACP shall include a walk test feature. It shall include the ability to test initiating device circuits and notification appliance circuits from the field without returning to the panel to reset the system. Operation shall be as follows:
 - a) Alarming an initiating device shall activate programmed outputs, which are selected to participate in walk test, for three (3) seconds.
 - b) Introducing a trouble into the initiating device shall activate the programmed outputs for 8-seconds.
 - c) Walk test shall be selectable on a per device/circuit basis. All devices and circuits which are not selected for walk test shall continue to provide fire protection and if an alarm is detected, will exit walk test and activate all programmed alarm functions.
 - d) All devices tested in walk test shall be recorded in the history buffer.
- X. Waterflow Operation:
1. An alarm from a water flow device shall activate the appropriate alarm message on the eighty (80) character display, turn on all programmed notification appliance circuits.
 2. An alarm from the "Main Water Flow" device(s) shall activate the exterior horn/strobe(s). The exterior horn/strobe shall be electrically supervised. The silence button on the FACP shall have no affect on the exterior horn/strobe(s).

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- Y. Supervisory Operation: An alarm from a supervisory device shall cause the appropriate indication on the eighty (80) character display, light a common supervisory LED, but will not cause the system to enter the trouble mode.
- Z. Signal Silence Operation: The FACP shall have the ability to program each output circuit (notification, relay, speaker etc.) to deactivate upon depression of the signal silence switch.
- AA. Non-Alarm Input Operation: Any addressable initiating device in the system may be used as a non-alarm input to monitor normally open contact type devices. Non-alarm functions are a lower priority than fire alarm initiating devices.
- BB. The Fire Alarm Control Panel shall be equipped with a minimum of four (4) programmable buttons which will perform the following functions:
 - 1. Disable devices such as motorized fire dampers and certain fire door hold open devices. The DPS Project Manager will provide details for the specific installation.
 - 2. Signal bypass.
 - 3. Elevator bypass
 - 4. Almost dirty for detection.

2.04 CONDUIT/WIREMOLD AND WIRE

- A. Circuits and raceway:
 - 1. Fire alarm system wire and cable shall be installed in metal conduit regardless of code exceptions. EMT/ Conduit is required in concealed areas, including but not limited to mechanical rooms, above ceilings, pipe chases, attics, etc.
 - 2. Wiremold-700 is required in all exposed areas, including but not limited to corridors, hallways, classrooms, offices, restrooms, etc. Acceptable colors include Ivory or White, pending wall color.
 - 3. The system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.
 - 4. Raceway fill shall be less than 40% per NEC:
 - a) Raceway capacity between control panels and terminal cabinets shall be sufficiently sized to accept additional circuits in the future.
 - 5. Lay out circuits to serve a specific geographical area (zone) per floor.
 - 6. Field location of transponders and power supply panels may be allowed. Good access must be provided for testing and maintenance requirements.
 - 7. Cable must be separated from open conductors of power, or Class-1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, per the NEC.
 - 8. Wiring for 24-VDC control as related to the fire alarm system, alarm notification, emergency communication and similar power-limited auxiliary functions may be run in the same conduit as initiating and signaling line circuits. 120 V.A.C. must be in separate conduit.
 - 9. The design of the system shall permit use of IDC and NAC wiring in the same conduit with the SLC communication circuit.
 - 10. Conduit shall not enter the FACP, or any other remotely mounted control panel equipment or back boxes, except where conduit entry is specified by the manufacturer.
 - 11. Field wiring shall be electrically supervised for open circuit and ground fault.
 - 12. Initiating circuits shall be arranged to serve like categories (manual, smoke, water flow). Mixed category circuitry is not permitted except on signaling line circuits connected to intelligent reporting devices.
- B. EMT / Conduit:

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1. Existing conduit may be reused; however, any extension thereof shall be in wiremold 700.
2. Minimum 3/4-inch EMT.
 - a) Exception: Conduit runs to single device locations may be minimum 1/2-inch EMT.
3. Existing conduit meeting specified requirements may be reused provided the Architect and/or the System Design Engineer confirms existing raceways meet current codes and have adequate capacity to support the new devices. In areas where raceways have not been installed, the Fire Detection Contractor shall install new raceways in accordance with the DPS Design and Construction Standards Section 16110 Raceways.
4. Where EMT / Conduit are used, all steel fittings must be steel and set screw type, zinc die cast fittings are not allowed. Exception: All EMT/ Conduit mounted on the exterior of the building or in a wet environment must be water tight.
5. Fire alarm conduit shall be identified by spraying with red paint or applying red self-adhesive tape at least every three (3) feet at all changes in direction.
6. Also refer to other DPS Design and Construction Standards Division 16, for conduit.
7. Any Architectural metallic conduit system, must be UL listed and pre-approved by DPS and DFD.

C. Wiremold:

1. Wiremold 500 shall not be re-used. Fire Detection Contractor will remove Wiremold 500 and replace with specified raceway in DPS Design and Construction Standards Section 16110 Raceways.
2. Use Wiremold 700 in new raceways throughout in all exposed areas. EMT may be used in mechanical rooms and custodial areas. Wiremold color shall be ivory; scratches shall be touched up with Wiremold 700 ivory touchup paint. Any other painted Wiremold shall be painted only with Wiremold 700 ivory touchup paint. In areas where access is impossible, the use steel flexible conduit rated as fire alarm cable may be used.
3. All Wiremold 700 raceway shall be cut only by a Wiremold 700 cutter; any Wiremold raceway cut by a hacksaw or other unapproved means shall be removed and replaced at the Contractor's expense.
4. All Wiremold 700 raceway shall be bent only by a Wiremold 700 bender; any Wiremold 700 raceway bent by non pre-approved means shall be removed and replaced at the Contractor's expense.

D. Wire:

1. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 16-AWG or Initiating Device Circuits and Signaling Line Circuits, and 14-AWG for Notification Appliance Circuits.
2. 12-AWG is not allowed to be directly connected to notification appliances.
3. Wire shall be solid copper.
4. FACP primary power wiring shall be 12-AWG.
5. Field Wiring Terminal Blocks: For ease of service all panel I/O wiring terminal blocks shall be removable, plug-in types and have sufficient capacity for 18 to 14-AWG wire. Terminal blocks, which are permanently fixed, are not acceptable.

2.05 TERMINAL BOXES, JUNCTION BOXES AND CABINETS

- A. Also refer to other Division 16 standards for boxes and cabinets.
- B. Fire alarm junction and back boxes shall be identified by spraying at least one surface with red paint or applying red self-adhesive tape to the surface. Mask adjacent surfaces when spray-painting to avoid over-spray.

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2.06 ANCHORS

- A. Plastic anchors and percussion driven anchors are prohibited for any anchoring of the fire alarm system, guards, door holders, or door stops.
- B. Wall Anchors – Contractor shall install only drilled lead anchors. Alternate anchors must be submitted and approved by DPS Project Manager.

2.07 INITIATING DEVICES

- A. Detector indicator lights shall illuminate a solid red signal upon alarm and can be seen from the floor.
- B. All detectors shall have locking bases.
- C. Detectors and other fire alarm devices shall be mounted as flush as possible to the surface to minimize vandalism.
- D. Smoke Detection:
 - 1. Intelligent Photoelectric Smoke Detector:
 - a) The detectors shall use the photoelectric (light-scattering) principle to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density. It shall connect via two wires to the FACP signaling line circuit.
 - b) All photoelectric smoke detectors shall be low profile.
 - c) Detectors shall have locking bases.
 - 2. Intelligent Duct Smoke Detector:
 - a) The smoke detector housing shall accommodate an intelligent photoelectric detector that provides continuous analog monitoring and alarm verification from the panel.
 - b) When sufficient smoke is sensed, an alarm signal is initiated at the FACP, and appropriate action taken to change over air handling systems to help prevent the rapid distribution of toxic smoke and fire gases throughout the areas served by the duct system.
 - c) Photoelectric duct smoke sensors shall be located in the supply and return ductwork of all HVAC units rated in excess of two thousand (2,000) CFM. The remote test switch for the duct detection shall be in a readily accessible area.
 - d) All duct detection shall have a remote test switch readily accessible to the unit.
 - EXCEPTION:** With approval of AHJ, duct detectors may be eliminated if all HVAC units shut down upon activation of any general fire alarm.
 - e) Auxiliary SPDT relay contact.
 - f) Key-operated normal-reset-test switch.
 - g) Duct Sampling tubes extending width of duct.
 - h) Visual indication of detector actuation.
 - i) Duct-mounted housing.
- E. Heat Detection:
 - 1. Automatic Conventional Heat Detectors: Automatic heat detectors shall have a combination rate of rise and fixed temperature rated at 194-degrees Fahrenheit for areas where ambient temperatures do not exceed 100-degrees F, and 200-degrees F for areas where the temperature does not exceed 150-degrees F.
 - 2. Mechanical room heat detectors shall be rate anticipation heat detectors rated at 194-degrees Fahrenheit in rooms where the ambient temperature can rise above 100-degrees F, but does not exceed 150-degrees F.

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3. Automatic heat detectors shall be a low profile, ceiling mount type with positive indication of activation. The rate of rise element shall consist of an air chamber, a flexible metal diaphragm, and a factory calibrated, moisture-proof, trouble free vent, and shall operate when the rate of temperature rise exceeds 15-degrees Fahrenheit per minute. The fixed temperature element shall consist of a fusible alloy retainer and actuator shaft.
 4. Intelligent Thermal Detectors:
 - a) Thermal detectors shall be intelligent addressable devices rated at 135-degrees Fahrenheit and have a rate-of-rise element rated at 15-degrees Fahrenheit per minute. It shall connect via 2-wires to the FACP signaling line circuit.
 5. Explosion proof heat sensors shall be used in gasoline storage areas and other areas as required by the AHJ.
- F. Addressable Pull Station:
1. Addressable pull station(s) shall, on command from the control panel, send data to the panel representing the state of the manual switch and the addressable communication module status. They shall use a key operated test-reset lock and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.
 2. All operated stations shall have a positive, visual indication of operation and utilize a key type reset.
 3. Conventional manual stations with a mini-monitor located within the back box will be acceptable.
 4. A double-contact pull station shall be located adjacent to FACP:
 - a) One (1) contact shall provide alarm directly through the transmitter.
 - b) Override all disabled points on the FACP including horn/strobes.
- G. Projected Beam Smoke Detector:
1. Projected beam smoke detector shall consist of an infrared transmitter and receiver. Units shall be mounted on opposite walls or on ceiling across from each other. Beam smoke detector shall be designed in accordance with the NFPA and the AHJ.
 2. Detector shall contain a built-in automatic gain control to compensate for gradual deterioration of signal due to dust accumulation, component aging and temperature fluctuation. Receiver and transmitter may be powered separately or together for maximum flexibility. Unit shall have selectable sensitivity at 30% or 55% total obscuration.
 3. Provide remote test station and remote annunciator LED located in central location for each detector and label.
- H. Sprinkler Systems:
1. Provide modules for flow and tamper switches.
 - a) If the building currently has a partial sprinkler system, provide modules for that system and modules for flow and tamper switches for each floor and a set of modules for the main flow and tamper switches.
 - b) If the building currently has a full sprinkler system, connect all existing flow and tamper switches to the new system.
 2. Waterflow Indicator:
 - a) Waterflow Switches shall be an integral, mechanical, non-coded, non-accumulative retard type.
 - b) Waterflow Switches shall have an alarm transmission delay time, which is conveniently adjustable from 0 to 60-seconds. Initial settings shall be thirty (30) to forty five (45) seconds.
 - c) All waterflow switches shall come from a single manufacturer and series.

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- d) Waterflow switches shall be provided under a separate bid package by Division 15 and connected under this section.
- 3. Sprinkler and Standpipe Valve Supervisory Switches:
 - a) Each sprinkler system water supply control valve riser, zone control valve, and standpipe system riser control valve shall be equipped with a supervisory switch. Standpipe hose valves, and test and drain valves shall not be equipped with supervisory switches.
- I. Valve supervisory switches shall be provided and installed.
 - a) Post Indicator Valve (PIV) or main gate valves shall be equipped with a supervisory switch.
 - b) The switch shall be mounted so as not to interfere with the normal operation of the valve and adjusted to operate within two revolutions toward the closed position of the valve control, or when the stem has moved no more than one fifth of the distance from its normal position.
 - c) The supervisory switch shall be contained in a weatherproofed aluminum housing, which shall provide a 3/4-inch conduit entrance and incorporate the necessary facilities for attachment to the valves.
 - d) The switch housing shall be finished in red baked enamel.
 - e) The entire installed assembly shall be tamper proof and arranged to cause a switch operation if the housing cover is removed, or if the unit is removed from its mounting.

2.08 NOTIFICATION DEVICES

- A. Provide required annunciation including: horns, strobes and voice for all areas including classrooms, gymnasiums auditoriums, and other spaces greater than one hundred (100) square feet (exceeding current code requirements).
- B. Visual alarm strobes shall be mounted eighty (80") to ninety-six (96") inches (to center) above the floor level within a space or six (6") inches (to center) below the ceiling, whichever is lower or as required by current ADA requirements. In general, visual alarm strobes shall be no more than fifty (50') feet from any point in a room or corridor. Do not install strobes in small toilets in kindergarten classrooms. Strobes shall be UL listed in accordance with the AHJ.
- C. Provide horn/strobes in each classroom, office, and other spaces greater than one hundred (100) square feet (exceeding the current code requirements). Provide UL listed Lexan guards for all horn/strobes excluding ceiling mount horn/strobes above 10'-0". Guards must be pre-approved by the DPS Project Manager.
- D. Strobe Lights:
 - 1. Strobe lights shall meet the requirements of the ADA, UL Standard (latest edition), and shall meet the following criteria:
 - a) The maximum pulse duration shall be 2/10-second.
 - b) The flash rate shall not exceed two flashes per second (2-Hz) nor be less than one flash every second (1-Hz) throughout the listed voltage range of the appliance.
 - c) Strobe intensity shall meet the requirements of NFPA 72. Strobes shall be synchronized.
 - d) The flash rate shall meet the requirements of UL, latest edition.
 - e) The light source color shall be clear.
 - f) For wall installation the appliance shall be placed eighty (80) to ninety-six (96) inches above floor level or 6-inches below the ceiling, whichever is lower. Ceiling mount is encouraged.
- E. Horn: Horn shall be capable of operating at 24-Volts. Horn shall be UL listed in accordance with the AHJ for fire protective signaling systems. The horn shall have a minimum of two (2) audibility options and shall

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produce a temporal-3 pattern.

F. Horn/Strobe Combination:

1. Horn/strobe shall be listed to UL and UL-464 (latest edition) and shall be approved for fire protective service. Horn/Strobe shall be wired as a primary signaling notification appliance and comply with the Americans with Disabilities Act requirements for visible signaling appliances.
2. The strobe light shall consist of a xenon flash tube and associated lens/reflector system.
3. The horn shall have two (2) audibility options and shall produce a temporal-3 pattern.
4. Strobes shall be powered independently of the sounder with the removal of factory installed jumper wires.
5. The horn/strobe shall operate on a coded or non-coded power supply.

G. Synchronization Module:

1. The synchronization module shall be listed to UL-464 and shall be approved for fire protective service.
2. The module shall synchronize strobes at 1-Hz and horns at temporal-3. The module shall be capable to silence the horns on horn/strobe models, while still operating the strobes, over a single pair of wires.
3. The module shall be capable of multiple zone synchronization by daisy chaining multiple modules together and re-synchronizing each other along the chain.
4. The module shall not operate on a coded power supply.

H. Remote Indicating Light:

1. Visual LED annunciation with active current regulator.

2.09 MODULES

A. Addressable Dry Contact Monitor Module:

1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional alarm initiating devices to one of the FACP SLCs. It shall connect via two (2) wires to the FACP signaling line circuit.
2. The monitor module shall mount in a 4-inch square, 2-1/8-inch deep electrical box.
3. The IDC zone shall be suitable for Style-D or Style-B operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.
4. For difficult to reach areas, the monitor module shall be available in a miniature package and shall be no larger than 2-3/4-inch x 1-1/4-inch x 1/2-inch. This version need not include Style-D or an LED.

B. Two Wire Detector Monitor Module:

1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional two (2) wire smoke detectors or alarm initiating devices.
2. The IDC zone may be wired for Class-A or B (Style-D or Style-B) operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.

C. Addressable Control Module:

1. Addressable control modules shall be provided to supervise and control the operation of one conventional NACs of compatible, 24-VDC powered, polarized audio/visual notification appliances. For fan shutdown and other auxiliary control functions, the control module may be set to operate as a dry contact relay.
2. The control module NAC may be wired for Style-Z or Style-Y (Class-A/B) with up to 1 amp of inductive A/V signal, or 2-amperes of resistive A/V signal operation, or as a dry contact (Form-C) relay. The relay coil

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shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary relay or NACs may be energized at the same time on the same pair of wires.

3. Audio/visual power shall be provided by a separate supervised power circuit from the main FACP or from a supervised UL listed remote power supply.
4. The control module shall be suitable for pilot duty applications and rated for a minimum of 0.6-amps at 30-VDC.

2.10 GUARDS

- A. Stopper-II (STI-1100 with horn) for all existing and proposed manual pull station(s) .
- B. STI Damage Stopper model or equivalent guard for horn/strobes. Specify UL-listed metal guards on detector heads and Lexan guards on horn/strobes in corridors, staircases, gymnasiums, locker rooms, and any other areas with device mounted at less than 10-feet above finish floor.
- C. Mount all horn/strobes per ADA and provide UL listed, for the system provided, wire guards on detector heads and Lexan guards on horn/strobes in corridors, staircases, gymnasiums, locker rooms, and any other areas with device mounted at less than 10' above finish floor. Guards shall pre-approved by the DPS Project Manager.

2.11 GRAPHIC ANNUNCIATOR

- A. Follow current version of Denver Fire Department "Guideline for Graphic Wall Maps".
- B. Annunciator shall clearly indicate the location of each alarm-initiating device.
- C. Each high output LED lamp shall light when that device is in alarm.
- D. Provide a legend for each type of device.
- E. Location of the FACP and annunciator shall be shown with "You Are Here".
- F. Initiating devices, locations of special systems, room numbers, site map, street names and the locations of hydrants, FDC('s), main gas shutoff, main water shutoff, fire sprinkler shutoff, main electrical shutoff, etc. shall be shown as required by Denver Amendments Sections-509.1 Item #12 and 907.2.12.1.1.
- G. Annunciator and Map(s) shall have the correct orientation and layout of the building, including a North directional arrow.
- H. Graphic Annunciators shall be located by DFD and the AHJ.
- I. Alarms shall be annunciated in the following way:
 1. A backlit point graphic annunciator shall be provided. Each fire alarm initiating device shall be identified by a symbol and illuminated. The graphic representation of the building shall be divided into logical zones as described in 12 above and as required by the AHJ. Each device shall light when that device is in alarm. A LEGEND shall be provided for each type of device used. Provide a printer integral with the fire alarm panel.
- J. The annunciator shall be located at the first responder point of entry into the building in a location approved by the AHJ. With approval of the DPS Engineering Department and the AHJ, the annunciator may be located in the main office of the school. Whenever this is done, a graphic zone map, laid out in the same format as the main graphic zone map located at the first responder point of entry, shall be provided at the locations of the other LCD annunciators and the Fire Alarm Control Panel.
- K. An additional LCD annunciator and map shall be provided in the Maintenance Office.

2.12 GRAPHIC MAP(s)

- A. Mount wall map(s) in a permanent metal frame, behind Lexan. Permanently attach the framed map to the wall by the FACP.
- B. Follow current version of Denver Fire Department "Guideline for Graphic Wall Maps".

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- C. Graphic Map(s) shall be installed at Stair(s) and on each Level.
- D. Location of the Graphic Map shall be shown with “You Are Here”.
- E. Provide additional graphic zone maps in multilevel buildings. The additional zone maps shall be located on the other levels from where the main zone map is located. These zone maps shall represent only the level on which they are located.

2.13 ELEVATOR

- A. As required by AHJ, add elevator recall including necessary elevator modifications per latest Denver Codes. Upgrade the elevator to be capable of Phase II operation.
- B. Contractors shall include all components for the tie-in of the existing Elevator.
- C. If the existing building elevator(s) is missing or does not have recall functions and/or Fire Hat Operation in accordance with the AHJ and Denver Fire Department; the Contractor shall be responsible for all necessary components (including electrical equipment, elevator equipment and circuitry upgrades) for the complete upgrade of the elevator in accordance with the AHJ(s) and Denver Fire Department.
- D. Shunt Trip shall be designed and installation completed in accordance with the DPS Design and Construction Standards Section 15300.
- E. Contractor is responsible to contract directly with the DPS Elevator Maintenance Contractor to gain access to or complete work associated with all Elevator Shaft(s). Contractor shall be responsible (financially and to coordinate) for all 3rd Inspections for the elevator(s).

2.14 LOCATIONS

- A. Smoke sensors shall be located by the Engineer in accordance the latest adopted Edition of NFPA 72, IFC, Denver Amendments to the IFC, and the manufacturer's instructions. Even though NFPA 72 may be referenced in the specifications, it is required that the sensors not be located closer than 3'-0" to supply air diffusers or the transfer grill to the corridor and within 1'-6" of light fixtures.
- B. Smoke sensors may be omitted from closets where the area does not exceed twenty four (24) square feet and the least dimension does not exceed three (3') feet with approval of AHJ.
- C. Manual fire alarm boxes shall be located as required by the AHJ, also at all exits from Kitchens, Gyms, Boiler Rooms and Auditoriums/Stages. Pull stations shall be installed per ADA.
- D. Manual fire alarm boxes shall not be installed in chemistry labs, home economics labs, or wood and metal shops.
- E. Photoelectric smoke sensors shall be located in the following areas:
 - 1. Classrooms
 - 2. Offices
 - 3. Cafeterias
 - 4. Corridors
 - 5. Toilets
 - 6. Stairs
 - 7. Lobbies
 - 8. Vestibules
 - 9. Gymnasiums
 - 10. Electrical Rooms
 - 11. Custodial Closets, if water vapors and dust do not present a potential false alarm

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12. Locker Rooms, if vapors from showers do not present a potential false alarm
 13. Per the Denver Fire Department, for rooms more than nine hundred (900) square feet, DPS no longer has an Administrative Modification allowing undetected corners. As a result, Contractor might need to add an additional device
- F. Rate-of-rise heat sensors shall be located in the following areas:
1. Shower rooms
 2. Attics
 3. Crawl spaces
 4. Custodial closets with sinks
- G. Fixed temperature heat sensors shall be located in:
1. Boiler rooms
 2. Kitchens
 3. Kiln rooms
 4. Exterior installations
- H. Heat sensors located in attics and crawl spaces shall be spaced in accordance with their listing with the following exceptions:
1. The sensors must be accessible from catwalks or access doors. In existing buildings, the sensors should be located over existing catwalks. It is not required to add catwalks simply to meet spacing requirements unless directed by the AHJ to do so.
 2. Spacing may be modified in order to locate sensors where they will be accessible as acceptable by the AHJ.
 3. In crawl spaces or attics with limited access, heat sensors are to be located at the access to the space and at any equipment located in the space if acceptable to the AHJ.

2.15 MAGNETIC DOOR HOLD OPEN

- A. Magnetic door hold open release shall occur upon any alarm.
- B. Provide and install magnetic door hold open on all LMC/IMC (library) doors, gymnasium doors, auditorium doors, cafeteria / all-purpose doors, classroom doors, office doors, area separation doors and rooms greater than 100 square feet with access to the building corridors and hallway's (excluding Custodian closets, restrooms, and IDF/MDF rooms).
- C. Manual Door Hold Open Release Button:
1. Provide manual door hold open release button in each classroom, located by the room light switch.
 2. Provide manual door hold open release button, Carling switch model #170, normally closed, SPST.
 3. Manual door hold open release button cover shall be stainless steel faceplate.
- D. Magnetic Door Hold Opens:
1. Magnetic door holders shall be mounted in such a manner that they do not interfere with the ADA requirement of a 32" opening perpendicular to the door frame.
 2. The magnetic door holder shall be securely mounted and be vandal resistant.
 3. Some conditions may require a floor mounted magnetic door holder mounted on the wall to meet the ADA clearance and the secure mounting requirement while others may require the release mechanism in the door closer (provided by the Contractor).
 4. Coordinate mounting requirements to assure adequate support structure exists for mounting of

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door holders.

5. For remodel projects only, provide 10-gauge metal plate, 10-inch x 10-inch to mount magnetic door holder unless door holder is flush mounted. If mounted on a corner, make the plate 10-inch x 20-inch bent at a 90-degree angle to go around the corner. All mounting plates shall match the existing wall color.
 6. All hardware on the magnetic door holders shall be reassembled with Loctite or equal after all adjustments have been made.
- E. Power Requirements:
1. Magnetic door hold-opens and door closers with an electric hold-open feature shall be connected to a dedicated circuit from the building electrical system (120 volt AC) and shall not obtain their power from the fire alarm system or convenience outlets.
 2. The maximum number of magnetic door hold opens allowed per control relay is twenty (20).
- F. Adjust all door closers as required to function with the door holders and to provide an over travel stop by increasing resistance to protect the magnetic holders. Adjust all doors to latch from the magnetic door holder release.

2.16 SIGNAGE

- A. Identification signage must be installed for all equipment and modules installed above ceilings, behind access doors, or not readily accessible (identifying concealed equipment).
- B. All detectors bases, pull stations, duct detectors, control modules, etc. shall have addresses labeled with black lettering a minimum of 3/8" in height.
- C. Door Labels:
1. The Fire Detection Contractor shall provide a 1½" phonetic label, white letter on black background sign above each door indicating the room number where the detectors are located. Contractor shall use 3M double sided tape (3M 4408) on all phonetic labels. Where room numbers are permanently affixed, these signs may be deleted.
 2. Room numbers shall be installed above each door, centered on the door frame.

2.17 IBAS

- A. Include connection to Integrated Building Automation System (IBAS). Connect the trouble and supervisory alarms to the building Integrated Building Automation System (IBAS). Include any modifications to the IBAS to monitor these points via BAC Net or provide a module to broadcast on BAC Net. Trouble and supervisory alarms will also be transmitted to the Denver Fire Alarm Headquarters through the DFD transmitter.

2.18 DENVER FIRE DEPARTMENT RADIO TRANSMITTER

A. AES SUBSCRIBER INSTALLATION

1. Installers shall obtain permit from Denver Fire Prevention Bureau. The Denver Fire Department Lineshop shall determine the location for installation of the AES subscriber unit, A.C. outlet and external antenna if required.
2. Installation requirements include:
 - a) Mount subscriber unit in accordance with Denver Fire Department Lineshop standards.
 - b) Installation of electrical outlet on circuit dedicated for fire (if surface mounting outlet then 4" square box minimum size). Installation shall be completed in accordance with the current National Electrical Code (NEC).
 - c) Install ½" E.M.T. from transformer enclosure to subscriber. d) Install ½" E.M.T. from subscriber to F.A.C.P.
 - e) Pull in #12 ground wire from outlet to subscriber unit.
 - f) Install shielded solid wire (max. 18ga.) from F.A.C.P. to subscriber one (1) pair per zone. (shield will

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- be connected only in the subscriber)
- g) Install E.O.L. resistors in F.A.C.P. across N.O. contacts.(resistors come with subscriber)
 - h) F.A.C.P. will have NO city disconnects if currently installed they shall be removed.
 - i) F.A.C.P. output will include a minimum of Alarm, Trouble, and Supervisory (if required). Inform the Lineshop of any special alarm requests.
 - j) If external antenna is required $\frac{3}{4}$ " E.M.T inside to $\frac{3}{4}$ " rigid outside. No use of L.B's or pulling L's are allowed. The minimum bend radius is 1". Rigid conduit will be grounded per N.E.C. Typical installation will require 2 weatherproof gutters. Install per figures B and C. Pull in a pull string, the LMR-400 coax cable will be pulled in at the time of antenna installation (long pulls may be done prior to antenna install coordinate with Lineshop). Lineshop will terminate coax and install antenna.
 - k) Lineshop will program and terminate wires in subscriber unit.
3. The following parts will be required to be purchased: AES subscriber, the appropriate battery, and transformer for this subscriber. The subscriber unit shall be sent directly to the Lineshop from AES. An external antenna with poly phaser and coax cable may also need to be purchased and will require a survey by the lineshop to determine the need. The Denver Fire Department will own all of the equipment and will be responsible for maintenance on the equipment.
- a) AES subscriber model 7788F on DFD frequency 460.325 MHZ (for options the color is RED and 8 E.O.L. inputs)
 - b) Battery 12V 7.5 AH sealed lead acid (up to 9AH acceptable case dimensions approx. 6"Lx 2.5"Wx3.75"H prefer F1 terminals)
 - c) Transformer Amesco 16.5VAC 40 VA, AS-XF-1640Y (possible source approved dealers or ADI 303-777-1660)
 - d) Antenna AES # 7210-6-UC (if needed)
 - e) Poly phaser # IS-50NX-C2 (if needed) (possible source # Hutton 303-371-8182) the poly phaser from AES is also acceptable #7230
 - f) LMR-400 coax cable (if needed) (possible source All Cable 303-295-0106)
4. Note items a) and d) need to be ordered through approved vendors. Use your own suppliers for the remaining items.
5. Contact the Denver Fire Department Lineshop with questions 720-913-1820

PART 3 EXECUTION

3.01 INSTALLATION

- A. The Fire Alarm Control Panel (FACP) cabinet, AEC cabinets, interface cabinets and any N.A.C. cabinets shall be grounded to either a cold water pipe or grounding rod.
- B. Plastic anchors and percussion driven fasteners are prohibited.
- C. Synchronize visual notification devices when multiple devices are in a line of sight. Synchronize the circuit at the individual floor terminal cabinet.
- D. The Fire Detection Contractor shall not place N.A.C.'s and relays above ceilings or in MDF/IDF/DATA rooms.
- E. Smoke detectors shall not be located less than eighteen (18") inch from any light fixture and not less than three (3') feet from any HVAC ceiling mounted diffuser or fan.
- F. Relays shall be identified of their location inside the FACP on a directory card.
- G. Auxiliary controls shall have bypass buttons programmed for dampers, door mags (MHO's), elevators and when initiated will give an audible and visual trouble.
- H. The Fire Detection Contractor shall have an employee with Nicet-II (in fire alarm technology) on the project premises at all times that work is being performed through final acceptance by DPS.
- I. Initiating Devices (smoke and heat detectors) shall not be installed until after all drywall work and painting have been completed by the Contractor. Initiating Devices installed prior to the completion of all drywall

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work and painting shall be removed and replaced with new (un-cleaned) Initiating Devices (Used/re-manufactured equipment will not be allowed).

- J. During the installation, the Fire Detection Contractor shall provide emergency repair service for the fire detection system within four (4) hours of a request by the District. Service shall be available twenty four (24) hours per day, seven (7) days per week.

3.02 FIRE WATCH

- A. If at any time during construction of this project, the AHJ determines that a fire watch is required due to Contractor delays, methods, or sequencing of construction, the Contractor shall be responsible for the cost of such watch and obtain all permits required and pay for all project delays and fees as a result of Fire Watch.

- B. **Where a Fire Detection System is being installed to replace an existing Fire Detection System, or an existing Fire Detection System is being modified, or a building is under construction (partial or full), the existing Fire Detection System or Temporary System shall remain fully operational at all times. Denver Fire Department (DFD) requires a Fire Watch for the following conditions:**

1. Procedures While School is in Session, including all After School Activities:

- If the Fire Detection System must be taken off-line, disabled for any reason, or becomes inoperable, a Uniformed Denver Fire Department Fire Watch is mandatory.
- The Contractor must coordinate any Uniformed Denver Fire Department Fire Watch through the DPS Project Manager and Denver Fire Department. Upon receiving notification, the DPS Project Manager must notify Andy Raicevich, DPS Supervisor Community Use and Service Coordination Center (SCC) at (720) 423-4152.
- The Contractor must obtain a Fire Watch Permit and is responsible for all permitting fees.
- The Contractor shall pay for the Denver Fire Department Uniformed Fire Watch.
- Contact Denver Fire Department for the current hourly Fire Watch rates.

2. **Procedure While School is not in Session, and the Contractor would like to disable the Denver Fire Department Bronco Box or the Denver Fire Department AES Transmitter:**

- The Contractor must obtain a Denver Fire Department Fire Watch Permit and is responsible for all permitting fees and Fire Watch costs. Denver Fire Department will review each Fire Watch Permit request and determine which of the following types of Fire Watch will apply:
 - a) Denver Fire Department – Uniformed Fire Watch
 - b) DPS Security or a Bonded Company Identified by DPS Security c) Contractor Fire Watch
- If Denver Fire Department allows a DPS Security, or a Bonded Company identified by DPS Security, or a Contractor Fire Watch; the Fire Watch shall be in accordance with all Denver Fire Department requirements and the following Denver Public Schools requirements, including but not limited to:
 - a) DPS Security, or a Bonded Company identified by DPS Security, or the Contractor; shall be designated the Responsible Party(s). The Contractor shall be solely responsible for all fees associated with the Fire Watch.
 - b) The Responsible Party(s) must provide a copy of the Emergency Reaction Plan to Fire Watch personnel and the DPS Project Manager.
 - c) The Fire Watch is in effect during all construction hours and afterhours (if required by DFD). Only the Responsible Party(s) shall conduct the Fire Watch.
 - d) **THE RESPONSIBLE PARTY(S) CONDUCTING THE FIRE WATCH MUST HAVE NO OTHER DUTIES.**
 - e) The Contractor must provide specific work days and times the system is scheduled to be off-line. The Responsible Party(s) must call the DFD Systems Off-Line in accordance with DFD Fire Watch Permit requirements at (720) 913-3430 prior to taking any system off-line from the monitoring agency. The same number shall be used to inform the DFD Duty Officer that the system has been returned to normal operation. This will be a daily occurrence during the Fire

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Watch.

- f) **AT THE END OF EACH WORK SHIFT, THE SYSTEM MUST BE BACK ON-LINE AND ALL DETECTORS MUST BE UNCOVERED.** (Based upon the Construction Activities, DFD may amend these requirements on the Fire Watch Permit)
- g) The Responsible Party(s) doing Fire Watch **MUST HAVE MEANS OF 911 NOTIFICATION.**
- h) The Responsible Party(s) **MUST WALK THE FLOOR(S)** in the affected area a minimum of every 30 minutes.
- i) The Responsible Party(s) **MUST MAINTAIN AND COMPLETE THE DFD DAILY LOG** and track all issues and concerns during the Fire Watch. **THE DFD LOG MUST BE FAXED** by 10:00 pm daily to (720) 913-3596 and forwarded to the DPS Project Manager.
- j) If for any reason the Fire Detection System becomes disabled/ damaged during the Contractor Fire Watch, the Responsible Party(s) must immediately contact Denver Fire Department Dispatch at (720) 913-2400 (notifying the Duty Officer). Additionally, the Responsible Party(s) will complete the following:
 - Contact the DPS Project Manager.
 - Hire an Approved DPS Fire Detection Contractor to complete the necessary repairs.
 - The Approved DPS Fire Detection Contractor must obtain a City and County of Denver 3A Permit to complete the repairs.
 - The Building will remain on Fire Watch until the system has been repaired; inspected, tested, and all applicable permits have been signed off by the AHJ (City and County of Denver and Denver Fire Department) and DPS QA/QC and the DPS Project Manager.
- k) Fire Watch procedures are to remain in effect until the Fire Detection System is repaired, operable, and tested. Please contact the DFD Testing Section at (720) 913-3480 to schedule the system test.
- l) The Responsible Party(s) must notify the DFD Assistant Chief at (720) 913-3466 and/or the DFD Administrative Captain at (720) 913-3460 when the system is on-line and functioning.

3. Additional Contractor Responsibilities:

- It will be the responsibility of the Contractor to manage and preserve the functioning ability of the Fire Detection System during construction. The Contractor must properly protect all components of the Fire Detection System throughout the construction area to ensure the functionality and cleanliness of the system. If the Fire Detection System is compromised, the Contractor will be responsible for any and all repairs to the system.

3.03 TESTING

A. Fire Detection and Fire Suppression Onsite Construction Inspections:

- 1. The System Design Engineer, Architect (if applicable), and DPS Project Manager shall confirm the following items prior to completing the Contractor Pre-Test:
 - a) Spacing and coverage requirements for each type of detector installed.
 - b) Detectors shall not be installed within three (3') feet of any mechanical fans, heaters, grilles, registers or diffusers.
 - c) Detectors shall not be installed within eighteen (18") inches of any lighting.
 - d) Devices and suppression piping are not to be installed within four (4') foot of any equipment, includes but not limited to climbing ropes or wall, gymnasium equipment, etc.

B. Procedures Prior to any Contractor Pre-Test or Denver Fire Department Test:

- 1. Contractor must submit the Proposed Graphic Panel Map for approval a minimum of four (4) weeks prior to any Contractor Pre-Test and/or Denver Fire Department Test. This will allow both DPS and the Contractor adequate time to review, build a new or modify the existing Graphic Map, complete the installation or modifications, and time for the Contractor to test the Graphic Map prior to any Denver Fire Department Test.

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2. For all projects involving testing of any Flow or Tamper Switches for the Fire Suppression System or new Fire Alarm Control Panel installations, the Contractor must make provisions to have a Certified Fire Suppression Inspector/Tester attend the DFD Fire Department Test.
3. For all projects involving testing of any Elevator(s), the Contractor must make provisions to have the Certified DPS Contracted Elevator Technician attend the Contractor Pre-Test and DFD Fire Department Test. The Contractor is responsible for all associated costs for the Certified DPS Contracted Elevator Technician.

C. **Procedure for Fire Alarm Test:**

1. Testing shall be in accordance with NFPA 72, Chapter 7, as amended in Part I, UFC Standard 10-2.
2. The Contractor must have all applicable Permits signed off by the AHJ prior to completing the Contractor Pre-Test and DFD Test (**this includes the Rough-in signoff for the City and County of Denver #3A Permit**).
3. The Contractor must notify the DPS Project Manager and DPS QA/QC at least ten (10) working days prior to any Contractor Pretest date and at least ten (10) working days prior to any DFD Test date.
4. The Contractor must pretest 100% of the system for their scope of work and verify all the requirements (listed below) have been completed before calling for the DFD Test of the system.
5. The System Design Engineer, Architect (if applicable), DPS Project Manager, and the Fire Detection & Fire Suppression Team must be present for all Contractor Pretest's and acceptance testing by the Denver Fire Department and subsequent Denver Fire Department testing of the completed system.
6. The Contractor is responsible for providing five (5) two-way radio's for all Contractor Pretest(s) and DFD Testing. **THE CONTRACTOR IS NOT ALLOWED TO USE DPS FACILITY RADIOS FOR ANY TESTING.**
7. The System Design Engineer, Architect (if applicable), DPS Project Manager, and the Fire Detection & Fire Suppression Team and QA/QC must be present during all DFD acceptance testing, without exception.
8. The service of a competent, factory-trained engineer or technician (minimum NICET level 2) authorized by the manufacturer of the fire alarm equipment shall be provided to technically supervise and participate during the adjustments and tests for the system.
9. **The Contractor must furnish appliances, equipment, instruments, connecting devices, two-way radios, ladders, lifts, and all personnel for the tests.**
10. The Contractor must temporarily take offline the AES Transmitter prior to the start of any Pretest or Final Test. Upon completion of the Pretest or Final Test, the Contractor must place the AES Transmitter online. If the system has an existing DFD Radio Box, only the Facility Manager or Custodial Staff can temporarily take the system offline and put the system back online.
11. The DPS Project Manager must confirm the Contractor and/or the Facility Manager/ Custodial Staff have taken the system offline prior to the start of any testing and must confirm the system is back online at the conclusion of each test.
12. The DPS Project Manager and Contractor must verify the following fire detection systems are bypassed prior to the start of any test:
 - a) Horn/Strobes (if applicable)
 - b) Elevators (if applicable)
 - c) Magnetic Door Hold Opens (if applicable)
 - d) Mechanical Equipment (if applicable)
13. The System Design Engineer, Architect (if applicable), and the Contractor shall provide a written report

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of each test to the DPS Project Manager.

14. At the DFD inspection, a factory-trained Project Manager of the manufacturer of the major equipment shall demonstrate that the system functions properly in every respect.
15. General testing process:
 - a) Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
 - b) Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.
 - c) Verify activation of water flow switches.
 - d) Open initiating device circuits and verify that the trouble signal actuates.
 - e) Open and short signaling line circuits and verify that the trouble signal actuates.
 - f) Open and short notification appliance circuits and verify that trouble signal actuates.
 - g) Ground circuits and verify response of trouble signals.
 - h) Check presence and audibility of tone at alarm notification devices.
 - i) Verify the installation of all maps, signage, and that the point lit graphic is functional
 - j) Check & verify the system is free of all alarms, supervisories, and troubles prior to testing.
 - k) The Contractor shall provide DPS with a complete printed summary verifying that every device has been tested with a trouble and an alarm prior to final inspection authorization.
 - l) All punchlists from the System Design Engineer, Architect (if applicable), DPS, and DFD shall be completed prior to final inspection authorization and "Final Acceptance" as defined in the contract documents.
 - m) All relays and other power sources (door magnets, Dampers, FACP, N.A.C.'s, Remote Test Switches, etc.) shall be labeled with Electric Panel Circuit numbers and the location of the device. A card shall be installed inside the panel typewritten with the FACP electrical panel circuit number and field location followed by N.A.C.'s Point Lit Annunciator and relays.
 - n) **The system shall operate for three (3) days without an alarm, supervisory or trouble then the Contractor shall be authorized to proceed with final testing.**
 - o) Check installation, supervision, and operation of all intelligent smoke detectors using the walk test. Canned smoke (provided by Contractor and acceptable to the fire alarm equipment manufacturer) shall be used at the final inspection with Denver Fire Department to verify actuation of smoke detectors.
 - p) Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.
 - q) When the system is equipped with optional features, the manufacturer's manual shall be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

3.04 RECORD OF COMPLIANCE

- A. A record of compliance, Section-1-7.2 and Figure-1-7.2.1 in NFPA-72 shall be prepared for each system. Parts 1, 2 and 4 through 10 shall be completed after the system is installed and the installation wiring has been checked. Part 3 shall be completed after the operational acceptance tests have been completed. A preliminary copy of the record of compliance shall be given to the DPS Project Manager and to the Architect (if applicable) prior to scheduling an acceptance test. A final copy shall be provided after completion of the operational acceptance tests.

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3.05 FINAL INSPECTION INSTRUCTIONS

- A. The system manufacturer shall include hands-on, on-site factory training seminars for DPS Maintenance and Operations personnel. Training shall address programming, testing and maintenance of the fire alarm system network and building control panels.
- B. The Fire Detection Contractor shall provide a typewritten "Sequence of Operation".
- C. Provide a minimum of thirty-two (32) training hours for maintenance and operator training in two (2) separate sessions.
- D. System manufacturer shall provide certificate of training to attending DPS personnel.
- E. The system manufacturer shall provide training and training manuals for up to six DPS maintenance personnel to a level equal to a "Factory-Certified Programmer." The training shall be conducted at the vendor's local office or the factory. The Contractor may elect to provide out of Denver training, however, all costs, including transportation lodging and meals will be the Contractor's responsibility.

3.06 SOFTWARE MODIFICATIONS

- A. For all testing, the Fire Detection Contractor shall provide the services of a factory trained and authorized technician to perform system software modifications, upgrades and changes.
- B. If another qualified Fire Detection Contractor needs to make modifications to the Fire Alarm System, installing Fire Detection Contractor shall comply with all needs of the 2nd Fire Detection Contractor.

3.07 SPARE PARTS AND TOOLS

- A. Provide a quantity of 5% spare bases, smoke detectors, heat detectors, duct detectors, pull stations, horn/strobes, strobes only, power supplies, relays and modules with a minimum of five (5) smoke detectors; and a minimum of one (1) device for heat detector, duct detector, pull station, horn/strobe, strobe only, relays and modules.

3.08 WARRANTY

- A. In addition to the DPS Design and Construction Standards Warranty requirements, the Contractor shall complete the following:
 - 1. During the warranty period, the Fire Detection Contractor shall provide emergency repair service for the fire detection system within four (4) hours of a request by the District. Service shall be available twenty four (24) hours per day, seven (7) days per week.
 - 2. Twenty-three (23) months from the date of Substantial Completion, the Contractor shall repeat the system test demonstrating the system is operational without deficiencies. All deficiencies and defective parts shall be repaired and/or replaced in accordance with DPS Design and Construction Standards.

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3.09 FIRE ALARM CONTROL PANEL (FACP) STATUS & ACCEPTANCE REPORT

**DENVER PUBLIC SCHOOLS
 FIRE ALARM CONTROL PANEL (FACP) STATUS & ACCEPTANCE REPORT
 (To Be Completed Prior to the Start of Construction)**

This FACP Status & Acceptance Report will document the condition of the Fire Alarm Control Panel and Components prior to the start of any construction within the building.			
School:			
FACP Manufacturer:		FACP Model:	
Project Number:		GB Number:	
Project Scope of Work:			
DENVER PUBLIC SCHOOLS		CONTRACTOR	
DPS Project Manager:		Company Name:	
Phone Number:		Responsible Person:	
Cell Number:		Address:	
Email:		Phone Number:	
Construction Start Date:		Cell Number:	
		Email:	
During construction, the Contractor must properly protect all components of the FACP System throughout the construction area to ensure the functionality and cleanliness of the system! If the FACP System is compromised, the Contractor will be responsible for any and all repairs to the system.			
Current Fire Detection System Status: Circle all that apply (Normal, Disables, Troubles, Supervisory, or Ground Faults). List all deficiencies on Page 2.			NORMAL

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DISABLES	TROUBLES	SUPERVISORY	GROUND FAULTS
LIST OF DEFICIENCIES			

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

The DPS Project Manager will forward this document to QA/QC. QA/QC will forward this document to the affected DPS Maintenance Department to remedy the deficiencies prior to Estimated Contractor

Contractor Signature and Date:	
DPS Project Manager Signature and Date:	
DPS QA/QC or DPS FA/FS Department Signature and Date:	
DPS Maintenance Department Signature:	

DATE OF CORRECTION BY DPS MAINTENANCE DEPARTMENT

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DPS Maintenance Department Signature & Completion Date (UPON COMPLETION, FORWARD COPY TO QA/QC):	
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END OF SECTION