PROJECT MANUAL

Proposed Remodeling for:

Ashland City Hall

101 West Broadway

City of Ashland

Boone County, Ashland, Missouri

PORTER, BERENDZEN & ASSOCIATES, P.C.

ARCHITECTS

200 SOUTH HENRY CLAY BLVD.
P.O. BOX 446
ASHLAND, MO 65010

(573) 657-2022
E-MAIL: jay@pba-architecture.com

PROJECT MANUAL

Proposed Remodel for: Ashland City Hall
101 West Broadway
Boone County, Ashland, Missouri

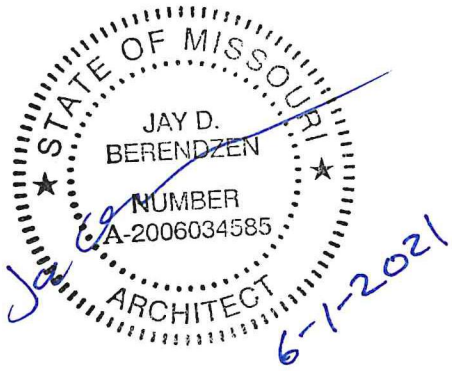
JOB NO. - pba-2108 - DATED- JUNE 2021

ARCHITECT:

Porter, Berendzen & Associates – P.C.
200 South Henry Clay Blvd. - P. O. Box 446
Ashland, MO 65010
P: (573) 657-2022

MEP ENGINEER:

MIDWEST ENGINEERING & DESIGN
3100 Brown Station Road, Suite C
Columbia, MO 65202
P: (573) 875-0045



This is to certify that these Plans and the Project Manual have been prepared by me or under my direct personal supervision and that I am a Registered Architect under the laws of the State of Missouri.

Jay D. Berendzen – MO #2006034585
License Expires: 12/31/22

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Note: Final Working Drawings and detailed Project Manual are to complement each other. Items included in one are to be assumed to be covered by the other. All work to be in accord with Federal, State and Local Codes and Regulations.

Codes used in the design of this project are:

Building Code	-	2012 International Building Code
Existing Building Code	-	2012 International Existing Building Code
Plumbing Code	-	2012 International Plumbing Code
Mechanical Code	-	2012 International Mechanical Code
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NOTICE TO BIDDERS

Notice to Bidders for a Remodel Project - City Hall, Ashland, Missouri.
Bids will be received until 3:00 pm, DST on June 22nd, 2021 at the building, 101 West Broadway, Ashland, MO 65010. Bids will be opened at that time and read aloud.

Correct Wage Order is No. 28

All work to be one contract under a General Contractor. The Owner reserves the right to reject any and all bids and to waive irregularities. Wage Determination: Annual Wage Order ~~No. 27~~ for Boone County. The Wage Order has been issued by the Missouri Division of Labor Standards. Copies of the Determination are a part of the bid documents.

The project consists of the remodel and improvements to an existing building to accommodate a City Hall and Police Station.
The existing building is steel framed. Work will include selective demolition to accommodate new layout for city offices and police station. Exterior improvements will be minor and there is an alternate for minor site work. The estimated cost of construction is $500,000.

The City of Ashland reserves the right to reject any or all bids and to waive any informality or technicality therein.

5% Bid Bond required; 100% Performance and Material Payment Bond required of the Contractor awarded the work.

Bid Documents will be available for viewing at various plan rooms. Bidders with questions may contact Porter, Berendzen & Associates, P.C., 200 S. Henry Clay Blvd., P.O. Box 446, Ashland, MO 65010. Phone: (573) 657-2022. Bid documents will be available June 1, 2021 from Triangle Blueprints, Columbia, MO: (573) 449-0404 or triangle@socket.net.
The Bid Documents will also be on file with The Builders' Association, CMD Group, Construct Connect, Dodge and ePlan.

A Pre-Bid Meeting will be held at 3:00 pm DST on June 15th, 2021 at the building site – 101 West Broadway - Ashland, MO 65010.

May 17, 2021

City of Ashland
109 East Broadway
P.O. Box 135
Ashland, MO 65010
/S/ Mr. Richard Sullivan, Mayor

Notice to Publisher: Please furnish affidavit of publication.
Insert two times – one week apart.

INSTRUCTION TO BIDDERS

IB-1 DEFINITIONS OF TERMS

Owner shall mean City of Ashland, Missouri
109 East Broadway – P.O. Box 135, Ashland, MO 65010 Ph: (573) 657-2091
Mr. Richard Sullivan, Mayor

Architect shall mean Porter, Berendzen & Associates – P.C. – Architects
200 South Henry Clay Blvd. - P.O. Box 446, Ashland, MO 65010
PH: (573) 657-2022 email: jay@pba-architecture.com

IB-2 PROPOSAL TIME AND LOCATION

Sealed proposals will be received by the Owner until 3:00 p.m. DST – June 22, 2021.
Bid Location:
Proposed Site of the City Hall – Enter through Main Entrance – see attached map.
101 West Broadway
Ashland, MO 65010

Project: Proposed Remodeling for: Ashland City Hall

It is the bidder's responsibility to deliver his proposal at the proper time, to the proper place. The Owner reserves the right to reject any and/or all bids, to waive any informalities, and to award the work to the lowest, responsible Bidder.

Pre-Bid Meeting:
A Pre-Bid Meeting will be held at 3:00 p.m. DST – June 15, 2021.
(Attendance is Recommended for General Contractors)
Pre-Bid Location:
Proposed Site of the City Hall – see attached map.
101 West Broadway
Ashland, MO 65010

IB-3 BIDS

1. Before making their bid, bidders shall carefully examine the Drawings and Project Manual and inspect the building site to make themselves thoroughly familiar with all of the requirements.
2. Bids to be submitted on a copy of the enclosed form.
3. Bids shall be made by filling out the Form of Proposal including a Bid on each and every Alternate listed on the Proposal. No qualified bids will be accepted. Bid Bond to be included.

IB-4 CONTRACT TIME

Work shall commence immediately upon execution of the contract and shall be substantially completed on/or before the date as stated on the Bid Form by the Contractor and agreed upon by the Owner. Note that the Bid Form states the Completion Date for the Contract.
See Division 00130 for Construction Schedule for various portions of the project.
Liquidated Damages will be assessed for delay. See 8.3.4 of Supplemental Conditions.

IB-5 SCOPE OF BIDS

Bids will be received for all of the work under a single contract.

IB-6 SUBSTITUTIONS

All product substitution requests must be submitted and approved prior to the bid date listed in this document. All Substitution Requests must be submitted on CSI 1.5C format or similar document with same language. It is the responsibility of the submitting party to confirm the following as listed on the substitution form:
• Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
• Same warranty will be furnished for proposed substitution as for specified product.
• Same maintenance service and source of replacement parts, as applicable, is available.
• Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
• Proposed substitution does not affect dimensions and functional clearances.
• Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.

IB-7 QUALIFICATIONS OF BIDDERS

Contractors submitting proposals for this work must actually be engaged in the class of work called for on the plans and in the Project Manual. Prior to being awarded the Contract, the successful Bidder to furnish evidence to the Owner and the Architect that they and their sub-contractors have sufficient resources and ability to perform the work of the Contract and to obtain the bonding and insurance required under the Contract.

IB-8 DRAWINGS AND PROJECT MANUALS

Drawings and Project Manual available from:
Triangle Blueprints
1907 Pennsylvania Drive
Columbia, MO 65202 Ph: 573-449-0404
e-mail: triangle@socket.net

IB-9 LIST OF DRAWINGS

See attached INDEX TO DRAWINGS – Division 000115
Drawings Bear: Project No. 2108 - Dated: JUNE 2021

Note: The "OFFICIAL" Project Manual and Drawings will have an original signature on the Title Page of the Project Manual and the Cover Sheet of the Drawings. The Architect and Owner are not responsible for any omissions or variations between the "OFFICIAL" and copies electronically reproduced.

IB-10 INTERPRETATION OF CONTRACT DOCUMENTS

Should any bidder find discrepancies in or omissions from the drawings or documents or should he be in doubt as to the meaning, he should at once notify the Architect, who will send written instructions to all bidders of record covering the items in question. This provision is intended to cover matters that may be obscure, indefinite or in conflict where the cost of the work is affected. No decision shall be given where a standard is established and work is required to meet that standard. No verbal statements by any representative of the Owner, Architect or anyone connected with the work will be effective or binding in any way.

IB-11 LAWS AND REGULATIONS

The attention of all bidders is called to Federal, State and Municipal laws, regulations and ordinances in reference to labor, materials, equipment, specifications, proposal or bids, contract bonds (Performance and Payment) and all other matters pertaining to the relationship between Owner, Contractor and Architect.

E-VERIFY (Mo. Rev. Stat. 285.530) Businesses that are awarded contracts after 1/1/2009 and exceeding $5,000 are to participate in E-Verify and affirm, by affidavit, that it does not knowingly hire employees in violation of U.S. immigration laws.

OSHA SAFETY PROGRAM All contracts taking effect on or after August 28, 2009 must provide to all On-Site employees a 10 hour OSHA construction safety program and certify that Safety Program has been completed. Contractors and subcontractors in violation of this provision will be subject to Penalty plus Amount per employee per day. Verify penalties - OSHA (Mo.Rev. Stat. 292.675).

PRODUCT PREFERENCES. By law when selection of products and services, the district must give preference to:

Missouri Businesses, or businesses that maintain Missouri Offices or places of business, when the quality of performance promised is equal to or better than, and the price quoted is the same as or less than, that of the other responsive providers (34.073 RSMo.).

Disabled veteran businesses that are Missouri businesses or businesses that maintain Missouri offices or places of business, When the quality of performance promised is equal to or better than the other bids and the price quoted is the same or less (34.374 RSMo.)

Commodities manufactured, mined, produced or grown within the state and all Missouri firms, corporations, or individuals who supply commodities when quality and price are approximately the same (171.181 RSMo.).

Food or beverages that contain a higher level of calcium if they are equal or lower in price and of the same type and nutritional quality (34.375 RSMo.).

Appliances that have earned the Energy Star under the Federal Energy Star program, when purchasing appliance with all or a portion of state funds, unless exempted by the commissioner of the office of administration (8.305 RSMo.).

Coal mined in the state of Missouri or and adjoining state, when purchasing coal for fuel purposes, if the cost is not greater then the cost of coal mined in any other state or states, including the cost of transportation (34.080 RSMo.)

IB-12 SALES TAX

Sales Tax is not required for this project. The Owner will furnish to the Contractor the Project Exemption Certificate and State of Missouri Exemption Form. Contractor is to make copies and furnish to all Sub-Contractors and suppliers.

IB 13 BID BOND - AIA Document A-310-1970

Bid Bond shall be submitted with the bid and shall be in the minimum amount of 5% of the submitted bid contained on the bid form.

IB 14 PERFORMANCE BOND & MATERIAL PAYMENT BOND Document A 312-1984

A payment bond and a performance bond in the full amount of the Contract Sum shall be provide by the Contractor. The form of the bonds shall be AIA Document A-312-1984 unless otherwise approved by the Owner. Bonds shall be issued by a responsible surety company that is authorized to do business in the State of Missouri, and shall be conditioned for (i) the faithful performance of all the terms of the Contract and (ii) to pay all lawful claims of Subcontractors, material suppliers, laborers, equipment and material rentals, and all third party person having just claims. The payment bond shall include such provisions required under Section 290.250 (Mo. Rev.Stat.) as will guarantee faithful performance of the prevailing hourly wage clauses in the Contract and shall meet the statutory requirements for payments bonds on Missouri public works projects.

IB 15 PERMITS, INSPECTIONS & FEES

Contractor shall make application for, obtain and pay for all necessary local permits, inspection fees, and certificates of inspection for all work covered by the drawings and project manual.

Please contact for additional information:

Address:	City of Ashland
	109 East Broadway
	Ashland, MO 65010
Phone:	573-657-2091

The City of Ashland will require a Business License for each contractor – cost is $15 per year. The drawings will be submitted to the City of Ashland for review and approval.

IB-16 GENERAL CONDITIONS

AIA Form A201-2017, as revised and amended.

IB-17 AWARD OF CONTRACT

The Contract will be awarded to the lowest bidder complying with the conditions of the Bid Documents and Contract Documents, providing the bid is reasonable and to the best interest of the Owner to accept it. The Owner reserves the right to reject any and all bids and to waive any irregularities.
In determining the lowest Responsible Bidder, the following elements will be considered:
Has suitable financial status, technical experience, adequate personnel to perform the work properly and expeditiously, prior experience with similar projects, history of successful, projects and timely completion, compliance with State and Federal Laws, contractor proximity to project for warranty work, other essential factors as pertinent to the specific project.
The owner reserves the right to accept any combination of Base Bid and requested Alternates (if any) and accept them in any order.
Upon request and within two (2) hours after the Bid, the Bidder shall submit to the Architect a properly executed Contractor Qualifications Statement - AIA Form A305 along with a list of Sub-Contractors/Suppliers.

IB 18 FORM OF CONTRACT

AIA A101-2017 "Standard Form of Agreement between Contractor and Owner", (2017 edition) as revised and amended for this project.

IB 19 ASBESTOS-FREE CERTIFICATION

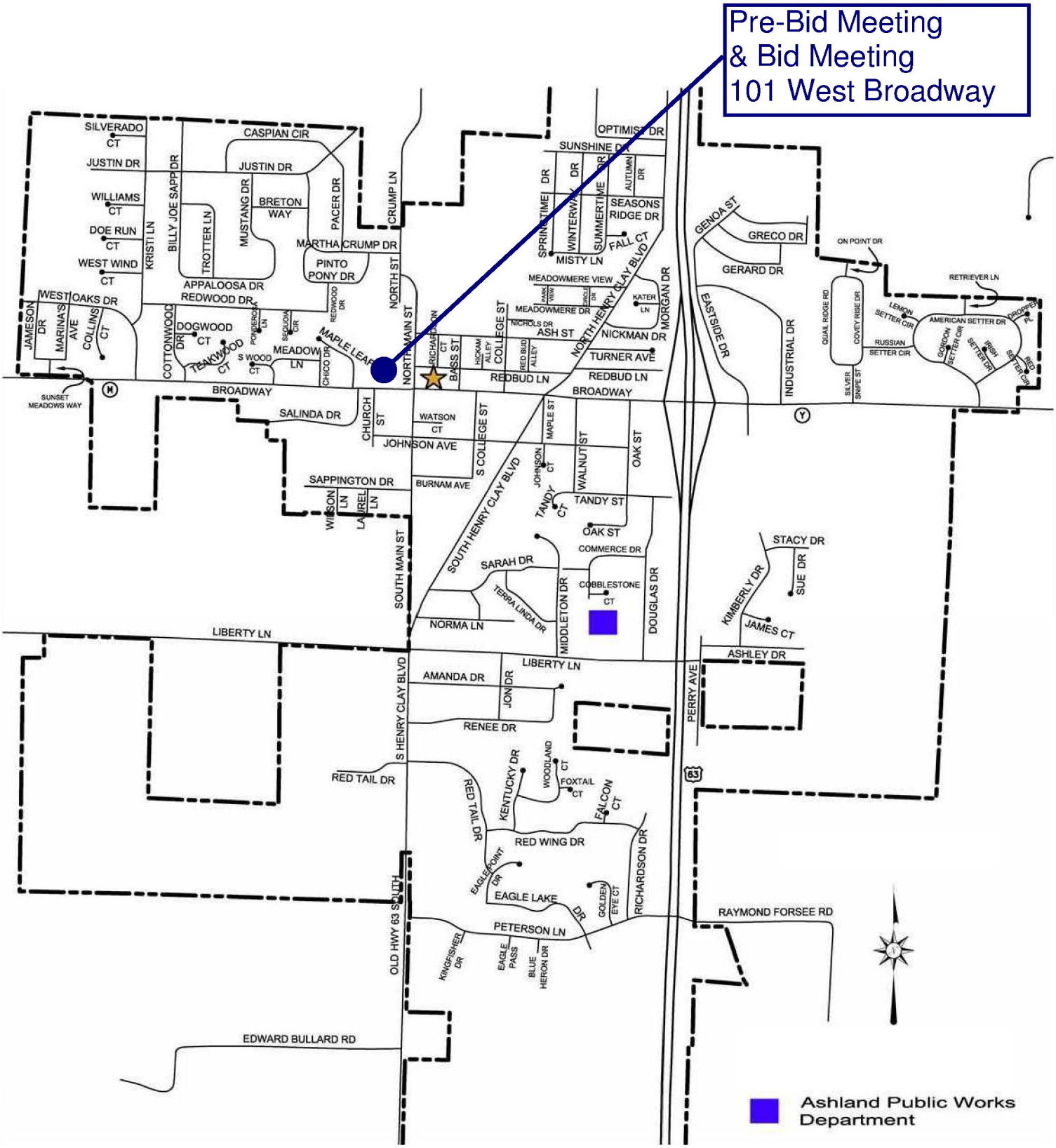
All materials specified and used on this project are intended to be asbestos free. General Contractor is to provide certification that NO asbestos containing material has been furnished on this project. This certification is to be provided with the project close-out documents.

IB 20 PREVAILING WAGES AND OTHER REQUIREMENTS

The Division of Labor Standards, State of Missouri, Department of Labor and Industrial Relations has set the Prevailing Wages to be paid - **Annual Wage Order No. 28 – Boone County,** Dated March 10, 2021 and any Incremental Increases are included in this manual. Not less than the prevailing hourly rate of wages must be paid to all workers performing work under this contract. Full compliance with the provision of Section 290.210 to 290.340 RSMo by the Contractor and Owner is to be an agreed part of this Contract. The Contractor will forfeit a penalty to the contracting Public Body of One Hundred dollars ($100.00) for each worker employed for each calendar day worked, or portion thereof, as provided under Section 290.250 RSMo.
Contractors who have been prosecuted and convicted of violating the Missouri Prevailing Wage Law are placed on the Contractor Debarment List. Contractors on the Debarment List are prohibited from contracting with any public body for the construction of any public works or from performing any work on any public construction project during the term of the debarment.
The contractor and all subcontractors to the contract must require all on-site employees to complete the ten-hour construction safety training program required under Section 292.675, RSMo, (enclosed in the laws section), if they have not previously completed the program and have documentation of having done so.

Every Transient employer, as defined in section 285.230, RSMo, Enclosed in the laws section, must post in a prominent and easily accessible place at the work site, a clearly legible copy of the the director of revenue; (2) Proof of coverage for workers' compensation insurance or self-insurance signed by the transient employer and verified by the department of revenue through the records of the division of workers' compensation; and (3) The notice of registration for unemployment insurance issued to such transient employer by the division of employment security. Any transient employer failing to comply with these requirements shall, under section 285.234 RSMo, Enclosed in the laws section, be liable for a penalty of $750 per day until the notices required by this section are posted as required by that statute.

MAP TO PRE-BID / BID LOCATION



DESCRIPTION OF THE WORK
Proposed Remodeling for Ashland City Hall

INDEX to DESCRIPTION OF WORK

Base Bid - Remodeling for new City Hall location including all interior remodeling, exterior building improvements and site improvements. All work on bid documents that are not indicated as and alternate.
Alternate No. 1 – Add Secure Parking Area with Fence.
Alternate No. 2 – Add Generator and Pad
Alternate No. 3 – Upgrade Lighting in South Area of Building
Alternate No. 4 – Voluntary Alternate by Contractor

BASE BID

The scope of work for Base Bid shall include but not be limited to the following:
(See the project drawings and project manual for more detail)

1. Provide all material, labor and equipment for Remodel of and Improvements to Existing Building as shown on the Bid Documents.
2. Provide all required material, labor and material for site work including but not limited to utilities, concrete slabs, grading, etc.

ALTERNTATE NO. 1 – Add Secure Parking Area with Fence.

Under the conditions of this alternate, state the ADD in cost to construct the new Secure Parking Area. The work is to include excavation and gravel lot construction, fencing & gates, grading, seeding & strawing, any lighting and electrical, etc.
Note that the new exterior ramp is to be in the base bid.

ALTERNTATE NO. 2 – Add Generator and Pad.

Under the conditions of this alternate, state the ADD in cost to provide and install a natural gas generator and concrete pad.
The base bid is to include the transfer switch and docking station.
See the drawings and specifications for additional information.

ALTERNTATE NO. 3 – Upgrade Lighting in South Area of Building.

Under the conditions of this alternate, state the ADD in cost to upgrade all lighting in the south portion of the existing building. See the electrical plans for addition information.

ALTERNTATE NO. 4 – Voluntary Alternate by Contractor

Space has been provided on the Bid Form for a Voluntary Alternate line.
Under the conditions of this alternate, state the DEDUCT in cost for Voluntary Alternate(s).
(Provide detailed description of voluntary alternate(s) on separate page with Bid Form)

Note: See the Project Drawings for additional information regarding the division of work among the Base Bid and the Alternates.
Also see Section 012100 for Allowances and 012300 for Alternates

CONSTRUCTION SCHEDULE

The Construction Schedule listed below is proposed by the City of Ashland. The final details are to be negotiated between the Owner and the Contractor awarded the contract.

PROPOSED CONSTRUCTION SCHEDULE

ALL WORK – BASE BID & All accepted Alternates

Schedule:

Notice of Award in July with an expected Contract Date of July 15, 2021.
Work to begin immediately after Contract is Executed.
Official Start Date to be set by Notice to Proceed issued by the Architect.

All work to be completed per General Contractor listed Number of Days.
Contractor to list Number of Days for:
Base Bid & accepted Alternates – All Work

SEE Article 8 of the General Conditions for Liquidated Damages.

City of Ashland
2108 – City Hall Remodel

FORM OF PROPOSAL

PROJECT : Proposed Remodeling for: Ashland City Hall
City of Ashland
Ashland, Missouri

Bids Due Until:
3:00 PM, DST – June 22, 2021

Bids received at the following location:
Proposed Site of City Hall
101 West Broadway - Ashland, MO 65010
Bids will be read aloud at that time.
Note: All Bids shall include all applicable taxes and fees.
Sales Tax not required – See Para IB-12 of Instructions to Bidders.
The project will be awarded under one contract for all work.

BASE BID: _____

_____ $_____)

(See 012100 – Allowances – Add to Base Bid) Confirmation:_____

Alternate No. 1 – Secure Parking Area with Fence: (ADD) $_____)

Alternate No. 2 – Generator and Pad: (ADD) $_____)

Alternate No. 3 – Upgrade Lighting in S. Area of Bldg.: (ADD) $_____)

Alternate No. 4 : $_____)

(Voluntary by Contractor) (DEDUCT) $_____)

$_____)

The undersigned agrees if this proposal is accepted, to enter into a contract, furnish bonds and insurance as specified within ten days of notification of such acceptance and complete the project after execution of the contract and in accord with Para IB-4. If no number of days are listed by the Contractor, the Owner will establish date for completion of the work.

Number of Days – Base Bid: _____calendar days.
(Notice of Award in July with an expected Contract Date of July 15, 2021)

Receipt of issued Addendum:

Addenda # 1 Date _____

By _____

Addenda # 2 Date _____

By _____

Addenda # 3 Date _____

By _____

ATTEST: _____

Corporation Seal, if Incorporated

Contractor: _____

By: _____

Address: _____

_____

Phone: (_____) _____

Fed ID No. _____

OWNER - CONTRACTOR AGREEMENT

The form of agreement for this project shall be:

AIA A101-2017 "Standard Form of Agreement between Owner and Contractor", (2017 edition) as revised and amended for this project.

A copy of this form may be seen at the Office of the Architect if not bound herein.

Also see Division 00720 – Supplementary Conditions

GENERAL CONDITIONS

The approved and published AIA A201-2017 "General Conditions of the Contract for Construction", (2017 edition) as revised and amended for this project is a part of this Project Manual.

A copy of this form may be seen at the Office of the Architect if not bound herein.

Also see Division 00720 – Supplementary Conditions

SUPPLEMENTARY GENERAL CONDITIONS

In addition to the modifications contained in the A201, the following revisions, amplifications and deletions apply to the General Conditions of the Contract. The Article Number refers to the same Article in the AIA Document A 201 Articles 1 thru 15. Modifications of these articles, whether wholly or partially changes take precedence over any statement contained in the AIA Document or in addition thereto. When any part of the AIA General Conditions is modified, voided or deleted by these Supplementary Conditions, the unaltered provisions shall remain in effect.

ARTICLE 1. - GENERAL PROVISIONS

1.4.1 Where, on any drawing, a portion of the work is drawn out, and the remainder is indicated in outline, the drawn out parts shall apply to all other like portions of the work. Where ornament or other detail is indicated by starting work only, such detail shall be continued throughout the courses or parts in which it occurs and shall apply to all similar parts of the work, unless otherwise indicated.

ARTICLE 3. - CONTRACTOR

3.15 Cleaning Up:

3.15.3 Each Contractor shall remove all waste materials and rubbish from the building and site not less than once a week.

3.15.4 The Contractor shall keep the premises and site free of any combustible waste materials and rubbish by removing same daily.

ARTICLE 7. - CHANGES IN THE WORK (Omit 7.3.7.1 thru 7.3.7.5)

Add: 7.3.6.6 The sum to be added to or deducted from the contract amount is to be determined on the basis of the cost of material plus cost of labor, plus taxes and insurance plus 10% to cover overhead and profit combined. The labor rates for Change Orders shall be the same as established and indicated in the payroll reports provided by the General Contractor – or as approved by Owner and Contractor. Actual statement for materials and supplies plus actual time record shall be furnished with all Requests for Payment covered by Change Orders. Any change in the number of days to complete construction is to be submitted with the agreed Change Order. See Article 9. Payments and Completion.

ARTICLE 8. - TIME Liquidated Damages

8.3.4 If the work embraced by this Contract is not completed on or before the date as stated by the Contractor in their bid or any approved extensions thereof, the actual damages for the delay will be impossible to determine and in lieu thereof, the Contractor shall pay to the Owner as fixed, agreed liquidated damages for each calendar day of delay until the work is satisfactorily completed and accepted by the Owner, a fixed and agreed amount as follows**: $500.00** per day. Contractor is to name the number of calendar days for Construction on the Bid Form. See Construction Schedule – Division 002415.

This date will be binding and Liquidated Damages will begin with the agreed date plus any agreed extensions. Requests for Extensions of Time to be included with each Pay Certificate and approved by the Architect and Owner. If said request is not approved or no request is made it will be assumed that there is no extension of time as of the date of the most recent approved Pay Request. Note that any milestone dates listed for portions of the work are also subject to the liquidated damages listed above – See Section 002415 Construction Schedule

ARTICLE 9. - PAYMENTS AND COMPLETION

9.3.4 The form used for application for payment shall be AIA Document G702 and shall be submitted in quadruplicate with a schedule of values of the various parts of the work, giving the following information for each item of the breakdown:

1. Total for the Project
2. Amount of Previous Payment
3. Amount of This Request
4. Value of Work to Date
5. Labor and Material Separated for each trade/division

9.3.5 This form shall indicate the retained percentage (5%) and amount requested by the application for payment.

9.3.6 The Architect will furnish samples of the Form to be used.

9.6.7 The Owner will make payments on the Contract as follows:
.1 Within fourteen days of receipt of the certificate, ninety-five percent (95%) of the value, based on contract prices, of labor and materials incorporated in the work and of materials suitably stored at the site thereof the first day of that month, as estimated by the Architect, less the aggregate of previous payments.

.2 Materials and equipment stored on another site, approved by the Owner and Surety and covered by adequate insurance secured and paid for by the Contractor, may be included upon special application.

.3 Final Payment will be made at the expiration of 30 days after completion and final acceptance of the Project by the Owner, provided no claims have been filed with the Owner.

.4 All payments will be subject to the Contractor having furnished the Owner suitable evidence, such as receipted invoices or lien waivers that all labor and material through the previous month have been paid for by the Contractor. Lien Waivers to have actual dollar amount.

.5 Final Lien Waivers will be required prior to Final Payment. Final Wage Determination paperwork must be submitted prior to Final Payment.

ARTICLE 10.5 - LEGAL PROCEEDINGS

10.5.1 In the event that legal proceedings should be brought against the Owner on account of any injury to persons or to the adjacent property described in ARTICLE 10, the Owner shall give notice to the Contractor responsible. The Contractor shall, at his own expense, defend such proceedings, pay or satisfy any judgment that may be rendered against the Owner in any such proceedings and pay all costs and expenses whatever incurred by the Owner in defense of such proceedings.

ARTICLE 11. - INSURANCE AND BONDS

11.1 CONTRACTOR'S LIABILITY INSURANCE
Revise as follows:

11.1.1 **Contractor's Liability Insurance:** The insurance required by Subparagraph 11.1.1 shall be written for not less than the following specified limits of liability or minimum limits required by law, whichever is greater.

Worker's Compensation:

State: Missouri	Statutory
Applicable Federal (e.g., Longshoreman's)	Statutory
Employer's Liability	$100,000/$500,000/$100,000

Comprehensive General Liability: including Premises-Operations, Independent Contractor's Protective, Products and Completed Operations, Broad Form Liability Endorsement, Demolition.

Bodily Injury and Property Damage
$1,000,000 Combined Single Limit

Products and Completed Operations to be maintained for two years after final payment.

Property Damage Liability Insurance will provide explosion collapse and underground coverage as applicable.

Contractual Liability:
Bodily Injury and Property Damage
$1,000,000 Combined Single Limit

Personal Injury, with Employment Exclusion:
$1,000,000 Aggregate

Comprehensive Automobile Liability for Owned, Non-Owned and Hired Motor Vehicles:
Bodily Injury and Property Damage
$1,000,000 Combined Single Limit

Comprehensive Umbrella Liability:
$5,000,000 Aggregate

Owner's Protective Liability Insurance: Add the following:

The Contractor shall be responsible for purchasing and maintaining Owner's Protective Liability Insurance naming Owner and Architect as named insured for the following limits:

Bodily Injury and Property Damage
$1,000,000 Combined Single Limit

11.2 OWNER'S LIABILITY INSURANCE
Add the following sentence:

"Purchase of any insurance required by this Contract shall not constitute a waiver of Owner's sovereign or governmental immunity."

11.3 PROPERTY INSURANCE
Add the following sentence:

11.3.1.1 Property Insurance (Builder's Risk) purchased by the Owner will not extend coverage to Contractor's tools, equipment, and other personal property.

Revise sentence as follows:

11.3.1.4 The Contractor shall purchase and maintain Installation Floater Insurance in the amount of the highest value of materials not installed at any one time. It will be the Contractor's obligation to keep such insurance at adequate level or be financially responsible for material and/or equipment not installed at job site.

NOTE: Contractor shall not commence work or allow any subcontractor to commence work until all insurance required has been submitted and approved by the Owner. The Contractor's Certificate of Insurance shall contain the statement: "The Insurance covered by this certificate will not be canceled or altered except after 60 days written notice has been received by the Owner."`

11.3.7 WAIVERS OF SUBROGATION
Add the following to the beginning of first sentence:
"If permitted by their respective insurers," the Owner and Contractor waive all rights against…

11.4 PERFORMANCE BOND AND PAYMENT BOND
11.4.1 Add the following subparagraphs:

11.4.1.1 Contractor shall furnish a Performance Bond and Labor and Material Payment Bond with the Owner named as Obligee in an amount at least equal to 100% of the Contract Price as security for the faithful performance of his contract and for the payment of all persons performing labor on the project and furnishing materials in connection therewith under his contract. The Surety on each bond shall be satisfactory to the Owner and shall be a duly authorized surety company with a current Certificate of Authority to transact business in Missouri. If requested by the Owner, the Surety shall furnish a certified copy of the Certificate of Authority.

11.4.1.2 The bonds required herein shall be written on AIA Document A312, Performance Bond and Labor and Material Payment Bond.

ARTICLE 15. - CLAIMS AND DISPUTES

15.1.6 Claims for Additional Time
Delete subparagraph 15.1.6.2 and replace with the following subparagraphs.

15.1.6.2 This contract shall include within the completion period for this project, the number of "adverse weather days" as specified under Section 012100 Allowances.

15.1.6.3 If adverse weather conditions are the basis for a claim for additional time, such claim shall be documented by data substantiating that weather conditions preclude performance of critical work activities for 50% of more of the contractor's scheduled work day and therefore request that day shall be declared unavailable for work due to weather and charged against the weather allowance.

15.1.6.4 The Contractor's and Owner's representatives shall agree monthly on the number of "adverse weather days" to be charged against the allowance. This determination will be documented in writing or in monthly meeting minutes. If there is a failure to agree on all or a part of the "adverse weather days" for a particular month, that disagreement shall be noted in this written documentation. Failure of the Contractor's representative to provide written documentation of dispute of the "adverse weather days" after it is presented, with or without the notes of disagreement, shall constitute agreement with the "adverse weather" day determination contained in the document.

15.1.6.5 There will be no modification to the time of contract performance due solely to the failure to deplete the "adverse weather day" allowance.

15.1.6.6 Once the "adverse weather day" allowance is depleted, a no cost Change Order time extension will be executed for additional "adverse weather days" as defined above and encountered during the remainder of the project.

OSHA and DRUG TESTING AFFIDAVIT

Attached please find the applicable affidavits for this Project. Also see the Instructions to Bidders, General and Supplemental Conditions.

AFFIDAVIT OF 10 HOUR OSHA TRAINING

Comes now _____ as _____first
Name Office Held

being duly sworn, on my oath, affirm _____ does
Company Name

comply with the requirements of Section 292.675, which requires all contractors and subcontractors doing work on the project to provide, and require its on-site employees to complete, a ten-hour course in construction safety and health approved by the Occupational Safety and Health Administration (OSHA) or a similar program approved by the Missouri Department of Industrial Relations which is at least as stringent as an approved OSHA program.

In Affirmation thereof, the facts stated above are true and correct (The undersigned understands that false statements made in this filing are subject to the penalties provided under Section 292.675, RSMo).

_____ _____
Signature (person with authority) Printed Name

_____ _____
Title Date

Subscribed and sworn to before me this _____ day of _____, 20___.

_____ _____
Signature of Notary Date

(seal)

Contractor's Affidavit Concerning Drug/Alcohol Testing Program

STATE OF MISSOURI)
) ss
COUNTY OF)

COMES NOW the Affiant after having first been duly sworn and testifies as follows:

My name is _____. I hold the principal office of _____ for _____. I, the undersigned, being duly sworn, certify that _____ is in compliance with the provisions of Missouri Revised Statute § 161.371; that _____ has established and implemented a random drug and alcohol testing program as required by Missouri Revised Statute § 161.371 and any applicable regulations. I further certify that _____ shall subcontract work only to subcontractors meeting the requirements of Missouri Revised Statute § 161.371.

_____
Name of Contractor

_____
Address

_____
City

_____
State

By:_____

Subscribed and sworn to before me this _____day of _____, 20___.

_____
Notary Public

My Commission Expires:

PREVAILING WAGE RATES AND AFFIDAVIT

Attached please find the applicable Prevailing Wage Rates for this Project and Missouri Department of Labor and Industrial Relations Affidavit form PW-4.

Missouri
Division of Labor Standards
WAGE AND HOUR SECTION

MICHAEL L. PARSON, Governor

Annual Wage Order No. 28

Section 010
BOONE COUNTY

In accordance with Section 290.262 RSMo 2000, within thirty (30) days after a certified copy of this Annual Wage Order has been filed with the Secretary of State as indicated below, any person who may be affected by this Annual Wage Order may object by filing an objection in triplicate with the Labor and Industrial Relations Commission, P.O. Box 599, Jefferson City, MO 65102-0599. Such objections must set forth in writing the specific grounds of objection. Each objection shall certify that a copy has been furnished to the Division of Labor Standards, P.O. Box 449, Jefferson City, MO 65102-0449 pursuant to 8 CSR 20-5.010(1). A certified copy of the Annual Wage Order has been filed with the Secretary of State of Missouri.

Original Signed by
Taylor Burks, Director
Division of Labor Standards

Filed With Secretary of State: **March 10, 2021**

Last Date Objections May Be Filed: **April 8, 2021**

Prepared by Missouri Department of Labor and Industrial Relations

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Asbestos Worker	$53.30
Boilermaker	*$29.89
Bricklayer	$47.96
Carpenter	$45.52
Lather	
Linoleum Layer	
Millwright	
Pile Driver	
Cement Mason	$43.58
Plasterer	
Communications Technician	$51.71
Electrician (Inside Wireman)	$52.90
Electrician Outside Lineman	$74.24
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Elevator Constructor	*$29.89
Glazier	$39.34
Ironworker	$59.74
Laborer	$39.77
General Laborer	
First Semi-Skilled	
Second Semi-Skilled	
Mason	*$29.89
Marble Mason	
Marble Finisher	
Terrazzo Worker	
Terrazzo Finisher	
Tile Setter	
Tile Finisher	
Operating Engineer	$59.21
Group I	
Group II	
Group III	
Group III-A	
Group IV	
Group V	
Painter	$37.48
Plumber	$66.54
Pipe Fitter	
Roofer	$54.20
Sheet Metal Worker	$53.89
Sprinkler Fitter	$55.78
Truck Driver	*$29.89
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

*The Division of Labor Standards received less than 1,000 reportable hours for this occupational title.
Public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center.
**The Prevailing Hourly Rate includes any applicable fringe benefit amounts for each occupational title.

Heavy Construction Rates for
BOONE County

Section 010

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Carpenter	$48.97
Millwright	
Pile Driver	
Electrician (Outside Lineman)	$74.24
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Laborer	$44.32
General Laborer	
Skilled Laborer	
Operating Engineer	$56.12
Group I	
Group II	
Group III	
Group IV	
Truck Driver	*$29.89
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

Use Heavy Construction Rates on Highway and Heavy construction in accordance with the classifications of construction work established in 8 CSR 30-3.040(3).

Use Building Construction Rates on Building construction in accordance with the classifications of construction work established in 8 CSR 30-3.040(2).

If a worker is performing work on a heavy construction project within an occupational title that is not listed on the Heavy Construction Rate Sheet, use the rate for that occupational title as shown on the Building Construction Rate Sheet.

*The Division of Labor Standards received less than 1,000 reportable hours for this occupational title. Public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center.

**The Prevailing Hourly Rate includes any applicable fringe benefit amounts for each occupational title.

OVERTIME
and
HOLIDAYS

OVERTIME

For all work performed on a Sunday or a holiday, not less than twice (2x) the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed or the public works contracting minimum wage, whichever is applicable, shall be paid to all workers employed by or on behalf of any public body engaged in the construction of public works, exclusive of maintenance work.

For all overtime work performed, not less than one and one-half (1½) the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed or the public works contracting minimum wage, whichever is applicable, shall be paid to all workers employed by or on behalf of any public body engaged in the construction of public works, exclusive of maintenance work or contractual obligation. For purposes of this subdivision, **"overtime work"** shall include work that exceeds ten hours in one day and work in excess of forty hours in one calendar week; and

A thirty-minute lunch period on each calendar day shall be allowed for each worker on a public works project, provided that such time shall not be considered as time worked.

HOLIDAYS

January first;
The last Monday in May;
July fourth;
The first Monday in September;
November eleventh;
The fourth Thursday in November; and
December twenty-fifth;

If any holiday falls on a Sunday, the following Monday shall be considered a holiday.

DIVISION OF LABOR STANDARDS

MISSOURI DEPARTMENT OF LABOR AND INDUSTRIAL RELATIONS

AFFIDAVIT
COMPLIANCE WITH THE PREVAILING WAGE LAW

I, _____, upon being duly sworn upon my oath state that: (1) I am the
(Name)

_____ of _____; (2) all requirements of
(Title) *(Name of Company)*

§§ 290.210 to 290.340, RSMo, pertaining to the payment of wages to workers employed on public works projects have been fully satisfied with regard to this company's work on _____;
(Name of Project)

(3) I have reviewed and am familiar with the prevailing wage rules in 8 CSR 30-3.010 to 8 CSR 30-3.060; (4) based upon my knowledge of these rules, including the occupational titles set out in 8 CSR 30-3.060, I have completed full and accurate records clearly indicating (a) the names, occupations, and crafts of every worker employed by this company in connection with this project together with an accurate record of the number of hours worked by each worker and the actual wages paid for each class or type of work performed, (b) the payroll deductions that have been made for each worker, and (c) the amounts paid to provide fringe benefits, if any, for each worker; (5) the amounts paid to provide fringe benefits, if any, were irrevocably made to a fund, plan, or program on behalf of the workers; (6) these payroll records are kept and have been provided for inspection to the authorized representative of the contracting public body and will be available, as often as may be necessary, to such body and the Missouri Department of Labor and Industrial Relations; (7) such records shall not be destroyed or removed from the state for one year following the completion of this company's work on this project; and (8) there has been no exception to the full and complete compliance with the provisions and requirements of Annual Wage Order No. _____ Section _____ issued by the Missouri Division of Labor Standards and applicable to this project located in _____ County, Missouri, and completed on the ____ day of _____, _____.

The matters stated herein are true to the best of my information, knowledge, and belief. I acknowledge that the falsification of any information set out above may subject me to criminal prosecution pursuant to §§290.340, 570.090, 575.040, 575.050, or 575.060, RSMo.

_____
Signature

Subscribed and sworn to me this ____ day of _____, _____.

My commission expires _____, _____.

_____
Notary Public

_____
Receipt by Authorized Public Representative

Missouri Department of Labor and Industrial Relations is an equal opportunity employer/program.

GENERAL REQUIREMENTS

Division 01

DIVISION 01 – GENERAL REQUIREMENTS
011000 - GENERAL PROCEDURE

1. MATERIALS AND WORKMANSHIP

1.1 General

A. All materials shall be new - the best obtainable - unless otherwise specifically covered by the drawings, specifications or approved by the Owner.

B. All workmanship and methods shall be first class and by persons qualified in the respective trades.

C. Appearance and quality shall be uniform throughout the work.

1.2 Quality

A. Materials or products specified by name of manufacturer, brand or trade name and/or catalog reference shall be the basis of the bid and furnished under the Contract.

B. Where two or more materials are named, the choice shall be optional with the Contractor.

C. The Owner does not intend to limit competition; bidders may submit proposals on materials or products of manufacturers other than those specified. These shall be submitted as price change alternates to the Base Bid, unless written approval is obtained to substitute at least seven days prior to submission of bids.

D. After bidding, the successful contractor may request substitutions by applying to the Owner in writing, stating the extra or credit involved including supporting data for consideration.

E. The Contractor shall submit, for Owner's approval, names of all materials and subcontractors he proposes to use in the work. This list may be submitted with bid, but in any event prior to executing the contract.
The Owner's decision is final and binding regarding materials subsequently proposed by the Contractor to satisfy the specification for quality. Samples may be required for selection of color, pattern, texture, etc.

1.3 Standards

A. Material or processes for which standards have been adopted by ASTM shall conform to those standards.

B. Methods shall be those recommended by the manufacturer of the material involved.

1.4 Substitutions

A. Mill tests, chemical analyses, manufacturer's specifications, and other such information as is available shall be submitted as part of quality when presenting substitute materials for Owner's approval.

B. If Contractor proposes construction method other than that shown or specified, complete drawings and engineering notes shall accompany request.

C. Contractor shall reimburse the Architect for any architectural or engineering service furnished, time required for checking the proposed change, and drafting time required for preparing as-built drawings made necessary by substitutions.

1.5 Stability

A. Members shall be rigid and securely anchored.

B. Members subject to vibration or cracking shall be attached with through bolts or cinch bolts.

C. Connections shall be adequate to with stand all strains for which they normally would be subjected.

1.6 Trueness

A. Surfaces and points of all materials fabricated on or off the site into a single article or composition, or into an assembly of units, shall be uniform, true, plumb level, properly curved or pitched is required and free from defects or blemishes.

2. SUBMITTALS – SHOP DRAWINGS

2.1 Product Data

A. Submit manufacturer current technical literature for each item along with shop drawings as required. Provide samples as required.

B. Quality Assurance – Provide Design Data, Test Reports: Provide manufacturer test reports indicating product compliance with indicated requirements.
Manufacturer Instructions: Provide manufacturer's written installation instructions.

3. TESTS FOR QUALITY (See General Conditions and Supplementary Conditions)

3.1 Independent laboratory tests not required except where called for in the specifications. If any material is questionable, contractor shall furnish acceptable proof of its quality or equality to standards specified, including laboratory tests when requested by Architect.

3.2 Where called for, tests shall be conducted by independent laboratory approved by Architect. Cost of such tests shall be borne by Contractor. Three copies of test reports to be furnished. This will be required for all soils and concrete testing listed on the drawings and/or in the specifications and is to include engineered fill.
Additional Special Testing/Inspections for masonry, reinforcing steel, structural steel will be arranged and paid for by the Owner.

4. SCHEDULE

4.1 Contractor will submit, as soon as possible, a schedule for all work involved. This shall be a bar graph type of progress schedule and will be used by the Contractor and Owner to schedule their activities.

5. REQUESTS FOR PAYMENT

5.1 Requests for payment shall be submitted to the Architect on or before the last day of the month if contractor desires payment by the 15th day of the next month. Payment requests made after that time will be held until the next month.

6. WARRANTIES AND GUARANTEES

6.1 Contractor shall turn over to Owner upon completion of the project any accompanying or attached written warranties or guarantees on items of equipment or material furnished and installed. Final Payment will not be made until all Lien Waivers, Guarantees and Warranties are submitted and approved.

END OF SECTION

DIVISION 01 – GENERAL REQUIREMENTS
012100 - ALLOWANCES

1. GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements governing allowances.

B. Types of allowances include the following:
   1. Lump-sum allowances.
   2. Contingency allowances.
   3. Unit Cost allowances.

C. Related Requirements:
   1. Section 012200 "Unit Prices" for procedures for using unit prices, including adjustment of quantity allowances when applicable.
   2. Section 014000 "Quality Requirements" for procedures governing the use of allowances for field testing by an independent testing agency.

1.3 DEFINITIONS

A. Allowance is a quantity of work or dollar amount established in lieu of additional requirements, used to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.

1.4 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection, or purchase and delivery, of each product or system described by an allowance must be completed by the Owner to avoid delaying the Work.

B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

C. Purchase products and systems selected by Architect from the designated supplier.

1.5 ACTION SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances in the form specified for Change Orders.

1.6 INFORMATIONAL SUBMITTALS

A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.

C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.7 LUMP-SUM AND UNIT COST ALLOWANCES

A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight, and delivery to Project site.

B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.

C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.

1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.8 CONTINGENCY ALLOWANCES

A. Use the contingency allowance only as directed by Architect for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.

Contractor's overhead, profit, and related costs for products and equipment ordered by Owner under the contingency allowance are included in the allowance and are not part of the Contract Sum. These costs include delivery, installation, insurance, equipment rental, and similar costs. Changes authorizing use of funds from the contingency allowance will include Contractor's related costs and reasonable overhead and profit.

1. The overhead and profit charge by the Contractor and all subcontractors shall be considered to include, but is not limited to: performance/payment bond, job site office expense, incidental job burdens, truck expense including mileage, small hand tools, project supervision including field supervision, company benefits and general office overhead. The percentages for overhead and profit charged on Work Authorizations shall be negotiated and may vary according to the nature, extent and complexity of the work involved. HOWEVER, THE OVERHEAD AND PROFIT FOR THE CONTRACTOR OR SUBCONTRACTOR ACTUALLY PERFORMING THE WORK SHALL NOT EXCEED EIGHT PERCENT (8%). WHEN ONE OR MORE TIERS OF SUBCONTRACTORS ARE USED, IN NO EVENT SHALL ANY CONTRACTOR OR SUBCONTRACTOR RECEIVE AS OVERHEAD AND PROFIT MORE THAN FIVE PERCENT (5%) OF THE COST OF THE WORK PERFORMED BY ANY OF HIS SUBCONTRACTORS. IN NO CASE SHALL THE TOTAL OVERHEAD AND PROFIT PAID BY THE OWNER ON ANY WORK AUTHORIZATION EXCEED FIFTEEN PERCENT (15%) OF THE COST OF MATERIALS, LABOR AND EQUIPMENT NECESSARY TO PUT THE CHANGE ORDER WORK IN PLACE.

   THE PERCENTAGE OF MARK-UPS PROVIDED HEREIN ARE INTENDED TO INCLUDE THE COSTS ASSOCIATED WITH ALL DELAY, DISRUPTION, EXTENDED JOB SITE PRESENCE AND HOME OFFICE OVERHEAD RESULTING FROM THE CHANGED WORK.

2. On proposals covering both increases and decreases in the amount of this contract, the application of overhead and profit shall be on the net change in the cost of the work.
3. The percentages for overhead and profit credit to the Owner on Work Authorizations that are SOLELY decreases in the quantity of work or materials shall be negotiated, and may vary according to the nature, extent and complexity of the work involved, but in no case shall be less than FIVE PERCENT (5%), unless the percentage for overhead and profit charged for Contract Changes for this contract, has been negotiated to less than TEN PERCENT (10%). The negotiated rate shall then apply to credits as well.

B. At Project closeout, credit unused amounts remaining in the Contingency Allowance to Owner by Change Order.

1.9 WEATHER ALLOWANCE

A. Included within the completion period for this project, are a specified number of "adverse weather" days (see Schedule of Allowances).

B. The Contractor's progress schedule shall clearly indicate the adverse weather day allowance as an "activity" or "activities". In the event weather conditions preclude performance of critical exterior work activities for 50% or more of the Contractor's scheduled workday, that day shall be declared unavailable for work due to weather (an "adverse weather" day) and charged against the above allowance. Critical work activities will be determined by review of the Contractor's current progress schedule.

C. The Contractor's and Owner's representatives shall agree monthly on the number of "adverse weather" days to be charged against the allowance. This determination will be documented in writing or monthly meeting minutes. If there is a failure to agree on all or part of the 'adverse weather" days for a particular month, that disagreement shall be noted in this written documentation. Failure of the Contractor's representative to provide written documentation of dispute of the "bad weather" day documentation after it is presented, with or without the notes of disagreement, shall constitute agreement with the "adverse weather" day determination contained in that document.

D. There will be no modification to the time of contract performance due solely to the failure to deplete the "adverse weather" day allowance.

E. Once this allowance is depleted, a no cost Change Order time extension will be executed for "adverse weather" days, as defined above and encountered during the remainder of the Project.

1.10 ADJUSTMENT OF ALLOWANCES

A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.

1. Include installation costs in purchase amount only where indicated as part of the allowance.
2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other markups.
3. Submit substantiation of a change in scope of Work, if any, claimed in Change Orders related to unit-cost allowances.
4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.

1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of Work has changed from what could have been foreseen from information in the Contract Documents.
2. No change to Contractor's indirect expense is permitted for selection of higher- or lower- priced materials or systems of the same scope and nature as originally indicated.

2. PRODUCTS (Not Used)

3. EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

A. Allowance No. 1; Contingency Allowance: Include a contingency allowance of **$25,000 (Fifty-Thousand Dollars)** for use according to Owner and Architects written instructions.

B. Allowance No. 2: Weather Allowance (Bad Weather Days): **Include Fifteen (5) bad weather work days** within contractor's completion period for this project.

1. This allowance includes Contractor overhead and profit.

END OF SECTION

DIVISION 01 – GENERAL REQUIREMENTS
012300 - ALTERNATES

1. GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if the Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternates into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Execute accepted alternates under the same conditions as other work of the Contract.

C. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

2. PRODUCTS (Not Used)

3. EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. 1; Secure Parking with Fence (ADD)- State amount to be added to Base Bid for all labor, materials, installation, overhead and profit to provide the secure parking lot with fence west of the building and all related work as indicated and shown on the construction documents.

B. Alternate No. 2; Generator and Pad (ADD)- State amount to be added to Base Bid for all labor, materials, installation, overhead and profit to provide the generator and pad north of the building and all related work as indicated and shown on the construction documents.

C. Alternate No. 3; Upgrade Lighting in South Area of Building (ADD)- State amount to be added to Base Bid for all labor, materials, installation, overhead and profit to provide the lighting upgrades for the south half of the building and all related work as indicated and shown on the construction documents.

D. Voluntary Alternate No. 4—Owner will consider Voluntary Alternates (DEDUCT) proposed by the Contractor for inclusion into the work.

END OF SECTION

DIVISION 01 – GENERAL REQUIREMENTS
014000 – QUALITY ASSURANCE

1. GENERAL

1.1 Requirements Included
- A. General Quality Control
- B. Mockups
- C. Manufacturer's Field Services
- D. Independent Testing Laboratory Services
- E. Conflicting Requirements

1.2 Related Requirements
- A. Technical Specifications Divisions

1.3 Quality Control, General
- A. Maintain quality control over suppliers, manufacturers, products, services, site conditions and workmanship to produce work of specified quality.
- B. Verify all measurements at the site prior to ordering any material or starting any of the parts of the work.
- C. If any work is found to be non-compliant with the plans and specifications, notify the Architect immediately and prior to proceeding with further work.

1.4 Manufacturer's Field Services
- A. When specified in respective Specification sections, each responsible Contractor will require the supplier or manufacturer to provide qualified personnel to observe field conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable and to make appropriate recommendations.
- B. Representatives shall submit written report to Architect listing observations and recommendations.

1.5 Testing and Inspections
- A. Testing and inspection are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Documents.
  1. Specific quality control requirements for individual construction activities are specified in the sections that apply to those activities.
  2. Specified tests, inspections and related actions do not limit Contractor's quality control procedures that facilitate compliance with the Contract Document requirements.
  3. Requirements for the Contractor to provide quality control services required by Architect, Owner or authorities having jurisdiction are not limited by provision of this section.
- B. Contractor Responsibilities: Unless otherwise indicated, coordinate quality control services specified and required by authorities having jurisdiction.
  1. Where services are indicated, Contractor will engage and pay for a qualified testing agency to perform these quality control services.
  2. Contractor shall notify testing agency at least 24 hours in advance of time when work that required testing or inspection will be performed.
  3. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.

C. Testing Agency Responsibilities: Owner will engage a testing agency to conduct special tests and inspections required by authority having jurisdiction.
   1. Testing agency will notify Architect and Contractor promptly of irregularities and deficiencies observed in the work during performance of its services.
   2. Testing agency will submit a certified written report of each test, inspection and similar quality control services to Architect with copy to Contractor.
   3. Testing agency will interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
   4. Testing agency will re-test and re-inspect corrected work.

D. Re-testing/Re-inspecting: Regardless of whether original tests or inspections were Contractor's or Owner's responsibility, Contractor to provide quality control services including re-testing and re-inspections for construction that revised or replaced work that failed to comply with the requirements established by the Contract Documents.

1.6 Conflicting Requirements

A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision prior to proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate for the context of the requirements. Refer uncertainties to Architect for a decision prior to proceeding.

END OF SECTION

DIVISION 01 – GENERAL REQUIREMENTS
015000 - TEMPORARY FACILITIES

1. TEMPORARY FACILITIES

1.1 General Contractor to provide, maintain and remove when directed a suitable temporary substantial storage building in which to place immediately after delivery all material which may be damaged by storage in the open.

1.2 Office - General Contractor shall provide temporary office facilities, including telephone. Location and removal of same shall be as directed.

1.3 Toilet - General Contractor to furnish and install suitable sanitary toilet facilities for use of all workmen on the project. This shall be maintained in a manner acceptable to local health authorities and shall be removed, together with any contents, when directed.

1.4 Utilities:

A. Water: Contractor to install temporary water service as required for project. Contractor to furnish all hoses and extensions as required.

B. Electric: General Contractor to arrange with his sub-contractor to install temporary electric service as required.

2. WORK IN COLD WEATHER

2.1 Protection: Proper preparation shall be made for the protection of the work, heating and materials and providing temporary heat for drying, curing and conditioning of operations and materials. General Contractor shall provide all heat, fuel and services necessary to protect all work and materials against injury from dampness and cold until the building has been enclosed. He shall provide temporary heating devices, installed in accordance with provisions of the NFPA as outlined in Pamphlets No. 31, 54, and 58, electrical power, adequate and proper fuel, enclosures, etc., for the work of all trades.

2.2 Temporary Heat: General Contractor shall enclose the building as promptly as possible. He shall be responsible for furnishing the Architect and Heating and Electrical Contractors with construction schedule that will establish the time the building will be enclosed and when heat from the permanent heating plant will be required. Such schedule must be prepared and presented promptly after construction has commenced.

2.3 Within ten day after the building is enclosed by the General Contractor, the Heating Contractor shall have the permanent heating plant, with sufficient and suitable new or used temporary unit heaters, radiators, etc., ready for service. The Electrical Contractor shall have electric service, wiring and equipment ready to utilize the heating plant. The building or units thereof will be considered enclosed by the Architect when the exterior walls are completely erected, when all interior framing has been erected, when the roof deck is complete and roofing is watertight, and when all openings in exterior walls are covered with protection that will provide reasonable heat retention.

2.4 Care, operation (automatic or manual) and services necessary to operate the heating system until completion and/or final acceptance of the building shall be the responsibility of the Heating Contractor and shall be furnished and paid for by him. All fuel and electricity required for the operation of this heating system shall be paid for by the General Contractor.

2.5 After enclosure, a minimum temperature of 50 degrees F. shall be maintained. During placing, setting and curing of plaster, ceramic tile, etc., a minimum temperature of 60 degrees F. shall be provided. For a minimum period of ten days prior to and during placing of woodwork, floor covering, painting, and other interior finishing, a minimum temperature of 70 degrees F. shall be maintained.

2.6 When the Architect certifies that the building is substantially completed and ready for occupancy or the Owner occupies same, the Owner shall assume all expenses of heating, including protection and operation of the system from the date of occupancy or certification.

2.7 Substantial completion means that the work is completed to the degree that all space can be occupied and used by the Owner for the purpose intended.

3. SHELTERS AND BARRICADES

3.1 Contractor shall erect shelters and barricades at sidewalks, alleys, and elsewhere as necessary to protect the work from damage at all times and to insure the safety of workmen and pedestrians. These shall be well lighted to protect the public. Any Contractor or his employee that removes any parts of a barricade to install his work shall replace the part as soon as possible after each operation. Should any damage or accident occur due to the removal of parts of the barricade, the Contractor that caused the parts of the barricade to be removed will be held responsible for the damage or accident.

3.2 Safety Fence - Install 4'-0" high plastic safety fence around construction and storage areas to restrict access. Metal posts at approximately 10'-0" o.c. Vehicle gates as required with locking devices.

END OF SECTION

DIVISION 01 – GENERAL REQUIREMENTS
017000 - PROJECT CLOSE OUT

1. OWNER'S RIGHT TO OCCUPY

1.1 The Owner may place and install equipment during the progress of the building, or occupy portions finished before the entire completion of the work. Such occupancy will not in any way evidence the completion or acceptance of any part of the work.

2. CONTRACTOR'S RESPONSIBILITY FOR WORK

2.1 Until final acceptance of the work, is evidenced in writing, Contractor shall have charge and care thereof and shall take necessary precaution against injury or damage to any part of the work. Contractor shall make good all damages occurring to any portion of the work before its completion and acceptance and shall bear the expense thereof; except damages beyond the Contractor's control and not due to his fault and negligence or by fire covered by insurance under the provisions of Article 11 or the General Conditions. Any material or equipment lost or stolen before or after it is placed in the building, but before acceptance of the building by Owner shall be made good at Contractor's expense.

3. CLEANING (See Article 3.15 of General Conditions)

3.1 When building is completed, General Contractor is to clean entire construction area of all rubbish and excess materials, no matter by whom it is left, and remove all of this from the building, the lot and adjacent areas. General Contractor is to remove all labels, paint spots on glass, clean and wash all glass thoroughly inside and outside and leave building "broom" clean.

4. CLOSE OUT DOCUMENTS (See Article 9 of General Conditions)

4.1 Prior to Final Retention Payment, the General Contractor will provide the following:
Record Set of Drawings – Mark Ups
O&M Manuals – 2 copies for Owner / electronic is acceptable for Architect
Warranties – Provide in O&M Manuals
Provide all Partial Lien Waivers
Provide all Certified Payroll
HVAC Test & Balance Report – also please provide extra filters/filter size for all units
Fire Alarm – Verify that testing has been completed.
AIA Document G706 – Contractor's Affidavit of Debts and Claims
AIA Document G706A – Contractor's Affidavit of Release of Liens
AIA Document G707 – Consent of Surety to Final Payment
Prevailing Wage Affidavit – Division of Labor Standards - Form PW-4 – All Contractors and Sub Contractors / Vendors.
1 Year Warranty – Provide General Warranty Statement on letterhead.
AIA Document G704 – Certificate of Substantial Completion – Architect to provide for signature by all parties. This will indicate start the 1-year General Warranty.

END OF SECTION

DIVISION 01 – GENERAL REQUIREMENTS
018000 - MISCELLANEOUS PROVISIONS

1. EXAMINATION OF PREMISES

1.1 See Instructions to Bidders regarding examination of drawings, specifications and premises. Bidders shall inform themselves of conditions where work in to be performed, concerning the site, obstacles and all other relevant matters. No extra compensation allowed for failure to secure information available prior to bidding.

2. MEASUREMENTS

2.1 Before ordering material or doing work, Contractor shall verify measurements at the building and be responsible for same. No extra compensation allowed for difference between actual dimensions and measurements indicated on the drawings; any difference found shall be submitted to the Architect for consideration before proceeding with the work.

3. CHASES, OPENINGS, INSERTS, ETC.

3.1 General Contractor shall build into all new construction necessary chases, slots and openings required for his own and/or contractor's work as shown on the drawings or requested by other contractors for their work. He shall cooperate with other contractors in the proper installation of sleeves, inserts, etc. furnished by the contractor or subcontractor concerned unless otherwise shown or specified.

4. EXISTING SERVICE LINES

4.1 All known existing services, piping, drains, conduit, etc., are shown or noted on the drawings covering the appropriate contract; removing or re-routing is so noted or specified. Notify Architect about services encountered which are not shown. Architect will direct disposition – an adjustment will be made in contract price for extra work involved. Adjusted price shall be agreed upon before work proceeds.

5. PRESENT CONDITIONS

5.1 See Site Plan for locations. Attention is called to the Site Preparation indicated for the location of the new building(s). Extra soil from the excavation of the footings and foundation and underground piping and/or conduits to be spread on site as indicated or to be removed from the site and deposited in an approved landfill.

5.2 See Contract Time – Para IB-4, Division 002415 Construction Schedule and Article 3 – AIA Document A101, Owner-Contractor Agreement.

6. USE OF SITE

6.1 Contractor to use site as may be required and as agreed with Owner. Coordinate construction areas with the Owner. Parking for Construction trades and employees to be identified and maintained by the General Contractor with final grades restored as necessary prior to completing the project.

7. ACCESS TO SITE

7.1 Access to site is to be from the main drive running through the site from Route Y to County Road. At least one end of this drive is to remain available for use by the School District at all times. The re-surfacing of this drive must be coordinated with the School District.
Protect existing sidewalks and utilities as required. See Civil Plans.

7.2 Additional access is to be coordinated with the school district.

7.3 Contractor parking to be coordinated by General Contractor. No parking on the public streets. The staging areas will be identified for the various additions and are to be identified, fenced and maintained by the General Contractor.
Note that the Bank tenant must remain in operation during construction. Coordination with Bank and City officials will be vital.

8. OCCUPANT SAFETY

8.1 Exterior – Provide and install Construction Safety Fence and maintain at all times.
Provide plastic, orange fencing with steel posts at maximum of 8'-0" o.c.
Note that the Bank tenant must remain in operation during construction. Coordination with Bank and City officials will be vital.

8.2 Interior – Maintain security when applicable during construction process. Install temporary enclosures / doors as required at all openings.

END OF SECTION

FACILITY CONSTRUCTION

Divisions 02 thru 19

DIVISION 02 – EXISTING CONDITIONS

SECTION 024000 - DEMOLITION

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE
- A. General and Supplementary General Conditions
- B. General Requirements
- C. Construction Drawings

1.2 SCOPE OF WORK
- A. This contractor shall remove the items as listed on drawings and called for below and dispose of them in a proper manner off-site.
- B. See Demolition Plans for demolition scopes – All sheets, including Civil.
- C. ASBESTOS - There are no known asbestos containing materials in the areas that are being remodeled.
  If any materials are encountered during demolition that the contractor suspects could contain asbestos, the contractor is to stop work immediately and contact the owner/architect. Any required abatement will be the responsibility of the owner and is to be removed by an approved abatement specialist conforming to all state and federal regulations.

2. PRODUCTS

1.1 PRODUCTS REMOVED
- A. All materials from the removal of site items, existing walls, windows, doors, ceilings, flooring, roofing, MEP fixtures, etc. and any additional items as necessary to perform the work.
- B. Existing concrete walks, canopies, foundations and walls as necessary for new construction and remodeling.

3. EXECUTION

1.1 PROPER DISPOSAL
- A. As required for removal and disposal off-site.
- B. All items to be re-used and installed by GC to be stored on site in approved location.
- C. All items to be removed and turned over to owner to be transported to secure location by contractor.

END OF SECTION

DIVISION 03 – CONCRETE
SECTION 033000 - CAST-IN-PLACE CONCRETE

1. GENERAL

1.1 RELATED DOCUMENTS

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

B. See the notes sheet on the structural plans for related specifications and required shop drawings and deferred submittals.

1.2 SUMMARY

A. Section Includes:

1. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.

B. Related Requirements:

1. Section 312000 "Earth Moving" for drainage fill under slabs-on-ground.
2. Section 321313 "Concrete Paving" for concrete pavement and walks.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.4 ACTION SUBMITTALS

A. Product Data: For each of the following.

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Blended hydraulic cement.
5. Performance-based hydraulic cement
6. Aggregates.
7. Admixtures:
   a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.
8. Color pigments.
9. Vapor retarders.
10. Floor and slab treatments.
11. Liquid floor treatments.
12. Curing materials.
13. Joint fillers.
14. Repair materials.

B. Design Mixtures: For each concrete mixture, include the following:

1. Mixture identification.
2. Minimum 28-day compressive strength.
3. Durability exposure class.

4. Maximum w/cm.
5. Calculated equilibrium unit weight, for lightweight concrete.
6. Slump limit.
7. Air content.
8. Nominal maximum aggregate size.
9. Steel-fiber reinforcement content.
10. Synthetic micro-fiber content.
11. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.
12. Intended placement method.
13. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Shop Drawings:
1. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
a. Location of construction joints is subject to approval of the Architect.

D. Concrete Schedule: For each location of each Class of concrete indicated in "Concrete Mixtures" Article, including the following:
1. Concrete Class designation.
2. Location within Project.
3. Exposure Class designation.
4. Formed Surface Finish designation and final finish.
5. Final finish for floors.
6. Curing process.
7. Floor treatment if any.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For the following:
1. Installer: Include copies of applicable ACI certificates.
2. Ready-mixed concrete manufacturer.
3. Testing agency: Include copies of applicable ACI certificates.

B. Material Certificates: For each of the following, signed by manufacturers:
1. Cementitious materials.
2. Admixtures.
3. Curing compounds.
4. Floor and slab treatments.
5. Bonding agents.
6. Adhesives.
7. Vapor retarders.
8. Semirigid joint filler.
9. Joint-filler strips.
10. Repair materials.

C. Material Test Reports: For the following, from a qualified testing agency:
1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Blended hydraulic cement.
5. Performance-based hydraulic cement.
6. Aggregates.
7. Admixtures:

D. Research Reports:
   1. For concrete admixtures in accordance with ICC's Acceptance Criteria AC198.
   2. For sheet vapor retarder/termite barrier, showing compliance with ICC AC380.
E. Preconstruction Test Reports: For each mix design.
F. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs Project personnel qualified as an ACI-certified Flatwork Technician and Finisher and a supervisor who is a certified ACI Flatwork Concrete Finisher/Technician or an ACI Concrete Flatwork Technician with experience installing and finishing concrete.
   1. Post-Installed Concrete Anchors Installers: ACI-certified Adhesive Anchor Installer.
B. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.
   1. Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
C. Laboratory Testing Agency Qualifications: A testing agency qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated and employing an ACI-certified Concrete Quality Control Technical Manager.
   1. Personnel performing laboratory tests shall be an ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.
D. Field Quality Control Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.
   1. Personnel conducting field tests shall be qualified as an ACI Concrete Field Testing Technician, Grade 1, in accordance with ACI CPP 610.1 or an equivalent certification program.

1.7 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on each concrete mixture.
   1. Include the following information in each test report:
      a. Admixture dosage rates.
      b. Slump.
      c. Air content.
      d. Seven-day compressive strength.
      e. 28-day compressive strength.
      f. Permeability.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with ASTM C94/C94M and ACI 301 (ACI 301M).

1.9 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 301 (ACI 301M) and ACI 306.1 and as follows.
   1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

2. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301 (ACI 301M).
3. Do not use frozen materials or materials containing ice or snow.
4. Do not place concrete in contact with surfaces less than 35 deg F (1.7 deg C), other than reinforcing steel.
5. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 (ACI 301M) and ACI 305.1 (ACI 305.1M), and as follows:
1. Maintain concrete temperature at time of discharge to not exceed 95 deg F (35 deg C).
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

2. PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301 (ACI 301M) unless modified by requirements in the Contract Documents.

2.2 CONCRETE MATERIALS

A. Source Limitations:
1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.
2. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant.
3. Obtain aggregate from single source.
4. Obtain each type of admixture from single source from single manufacturer.

B. Cementitious Materials:
1. Portland Cement: ASTM C150/C150M, Type I, gray.
2. Fly Ash: ASTM C618, Class C or F.

C. Normal-Weight Aggregates: ASTM C33/C33M, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.
1. Maximum Coarse-Aggregate Size: 3/4 inch (19 mm) nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Air-Entraining Admixture: ASTM C260/C260M.

E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
2. Retarding Admixture: ASTM C494/C494M, Type B.
3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.

F. Water and Water Used to Make Ice: ASTM C94/C94M, potable.

2.3 VAPOR RETARDERS

A. Sheet Vapor Retarder, Class A: ASTM E1745, Class A; not less than 15 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive tape.

2.4 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.

C. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.
   1. Color:
      a. Ambient Temperature Below 50 deg F (10 deg C): Black.
      b. Ambient Temperature between 50 deg F (10 deg C) and 85 deg F (29 deg C): Any color.
      c. Ambient Temperature Above 85 deg F (29 deg C): White.

D. Water: Potable or complying with ASTM C1602/C1602M.

E. Clear, Waterborne, Membrane-Forming, Curing and Sealing Compound: ASTM C1315, Type 1, Class A.
   1. Compound shall be certified by the manufacturer to not interfere with bonding of floor covering.

2.5 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber.

B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 in accordance with ASTM D2240.

C. Bonding Agent: ASTM C1059/C1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

D. Epoxy Bonding Adhesive: ASTM C881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade and class to suit requirements, and as follows:
   1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.6 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301 (ACI 301M).
   1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
   1. Fly Ash or Other Pozzolans: 15 percent by mass.
   2. Total of Fly Ash or Other Pozzolans: 15 percent by mass.

C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.
   1. Use water-reducing, high-range water-reducing, or plasticizing admixture in concrete, as required, for placement and workability.
   2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a w/c ratio below 0.50.

D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

2.7 CONCRETE MIXTURES

A. Footings: Normal-weight concrete.
1. Exposure Class: ACI 318 (ACI 318M) F2.
2. Minimum Compressive Strength: 3500 psi at 28 days.
3. Slump Limit: see S1.1 notes.
4. Air Content: see S1.1 notes.

B. Foundation and Building Walls: Normal-weight concrete.
1. Exposure Class: ACI 318 (ACI 318M) F1.
2. Minimum Compressive Strength: 4000 psi at 28 days.
3. Slump Limit: see S1.1 notes.
4. Air Content: see S1.1 notes.

C. Slabs-on-Grade: Normal-weight concrete.
1. Exposure Class: ACI 318 (ACI 318M) F0.
2. Minimum Compressive Strength: 4000 psi at 28 days.
3. Minimum Cementitious Materials Content: 540 lb/cu. yd.
4. Slump Limit: see S1.1 notes
5. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

D. All other concrete: Proportion normal-weight concrete mixture as follows.
1. Exposure Class: ACI 318 (ACI 318M) F2.
2. Minimum Compressive Strength: 4000 psi at 28 days.
3. Slump Limit: 5" maximum
4. Air Content: see S1.1 notes.

2.8 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M and ASTM C1116/C1116M, and furnish batch ticket information.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete in accordance with ASTM C94/C94M. Mix concrete materials in appropriate drum-type batch machine mixer.
1. For mixer capacity of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than five minutes after ingredients are in mixer, before any part of batch is released.
2. For mixer capacity larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

3. EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:

1. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.
2. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:
   1. Daily access to the Work.
   2. Incidental labor and facilities necessary to facilitate tests and inspections.
   3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.
   4. Security and protection for test samples and for testing and inspection equipment at Project site.

3.3 INSTALLATION OF EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.
   1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.

3.4 INSTALLATION OF VAPOR RETARDER

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.
   1. Install vapor retarder with longest dimension parallel with direction of concrete pour.
   2. Face laps away from exposed direction of concrete pour.
   3. Lap vapor retarder over footings and grade beams not less than 6 inches (150 mm), sealing vapor retarder to concrete.
   4. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.
   5. Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to floor slabs, grade beams, foundation walls, or pile caps.
   6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
   7. Protect vapor retarder during placement of reinforcement and concrete.
      a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches (150 mm) on all sides, and sealing to vapor retarder.

3.5 JOINTS

A. Construct joints true to line, with faces perpendicular to surface plane of concrete.
B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.
   1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.
   2. Place joints perpendicular to main reinforcement.
      a. Continue reinforcement across construction joints unless otherwise indicated.

b. Do not continue reinforcement through sides of strip placements of floors and slabs.

3. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
4. Locate joints for beams, slabs, joists, and girders at third points of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
6. Space vertical joints in walls as indicated on Drawings. Unless otherwise indicated on Drawings, locate vertical joints beside piers integral with walls, near corners, and in concealed locations where possible.
7. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
8. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:
1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.

D. Isolation Joints in Slabs-on-Ground: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated on Drawings.
2. Terminate full-width joint-filler strips not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished concrete surface, where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints:
1. Install dowel bars and support assemblies at joints where indicated on Drawings.
2. Lubricate or asphalt coat one-half of dowel bar length to prevent concrete bonding to one side of joint.

F. Dowel Plates: Install dowel plates at joints where indicated on Drawings.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.
1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.

B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.

C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect in writing, but not to exceed the amount indicated on the concrete delivery ticket.
   1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301 (ACI 301M), but not to exceed the amount indicated on the concrete delivery ticket.
   1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

E. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.
   1. If a section cannot be placed continuously, provide construction joints as indicated.
   2. Deposit concrete to avoid segregation.
   3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
   4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301 (ACI 301M).
      a. Do not use vibrators to transport concrete inside forms.
      b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer.
      c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
      d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

F. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
   1. Do not place concrete floors and slabs in a checkerboard sequence.
   2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
   3. Maintain reinforcement in position on chairs during concrete placement.
   4. Screed slab surfaces with a straightedge and strike off to correct elevations.
   5. Level concrete, cut high areas, and fill low areas.
   6. Slope surfaces uniformly to drains where required.
   7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
   8. Do not further disturb slab surfaces before starting finishing operations.

3.7 FINISHING FORMED SURFACES

A. As-Cast Surface Finishes:
   1. ACI 301 (ACI 301M) Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.
      a. Patch voids larger than 1-1/2 inches (38 mm) wide or 1/2 inch (13 mm) deep.

b. Remove projections larger than 1 inch (25 mm).
c. Tie holes do not require patching.
d. Surface Tolerance: ACI 117 (ACI 117M) Class D.
e. Apply to concrete surfaces not exposed to view.

2. ACI 301 (ACI 301M) Surface Finish SF-2.0: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.
   a. Patch voids larger than 3/4 inch (19 mm) wide or 1/2 inch (13 mm) deep.
   b. Remove projections larger than 1/4 inch (6 mm).
   c. Patch tie holes.
   d. Surface Tolerance: ACI 117 (ACI 117M) Class B.
   e. Locations: Apply to concrete surfaces exposed to view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.

B. Related Unformed Surfaces:
1. At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a color and texture matching adjacent formed surfaces.
2. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.8 FINISHING FLOORS AND SLABS

A. Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish:
1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats.
2. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 (ACI A117M) tolerances for conventional concrete.
3. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

C. Trowel Finish: Apply a trowel finish to interior concrete slabs, platforms, steps, ramps, and locations indicated on Drawings.
1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
2. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.
3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
4. Do not add water to concrete surface.
5. Do not apply hard-troweled finish to concrete, which has a total air content greater than 3 percent.
6. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.

7. Finish surfaces to the following tolerances, in accordance with ASTM E1155 (ASTM E1155M), for a randomly trafficked floor surface:
   a. Slabs on Ground:
      1) Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- (3.05-m-) long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch (3 mm) in 2 feet (610 mm).
      2) Specified overall values of flatness, FF 35; and of levelness, FL 25; with minimum local values of flatness, FF 24; and of levelness, FL 17.

D. Broom Finish: Apply a broom finish to exterior concrete slabs, platforms, steps, ramps, and locations indicated on Drawings.
   1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.
   2. Coordinate required final finish with Architect before application.

3.9 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

A. Filling In:
   1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
   2. Mix, place, and cure concrete, as specified, to blend with in-place construction.
   3. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

3.10 CONCRETE CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
   1. Comply with ACI 301 (ACI 301M) and ACI 306.1 for cold weather protection during curing.
   2. Comply with ACI 301 (ACI 301M) and ACI 305.1 (ACI 305.1M) for hot-weather protection during curing.
   3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h (1 kg/sq. m x h), calculated in accordance with ACI 305.1,) before and during finishing operations.

B. Curing Formed Surfaces: Comply with ACI 308.1 (ACI 308.1M) as follows:
   1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
   2. If forms remain during curing period, moist cure after loosening forms.
   3. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:
      a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
      b. Continuous Sprinkling: Maintain concrete surface continuously wet.
      c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.

d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.

e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.

1) Recoat areas subject to heavy rainfall within three hours after initial application.

2) Maintain continuity of coating and repair damage during curing period.

C. Curing Unformed Surfaces: Comply with ACI 308.1 (ACI 308.1M) as follows:

1. Begin curing immediately after finishing concrete.

2. Interior Concrete Floors:

a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:

1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.

a) Lap edges and ends of absorptive cover not less than 12-inches (300-mm).

b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.

2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive.

a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.

b) Cure for not less than seven days.

3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:

a) Water.

b) Continuous water-fog spray.

b. Floors to Receive Curing Compound:

1) Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.

2) Recoat areas subjected to heavy rainfall within three hours after initial application.

3) Maintain continuity of coating, and repair damage during curing period.

4) Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.

c. Floors to Receive Curing and Sealing Compound:

1) Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller in accordance with manufacturer's written instructions.

2) Recoat areas subjected to heavy rainfall within three hours after initial application.
3) Repeat process 24 hours later, and apply a second coat. Maintain continuity of coating, and repair damage during curing period.

3.11 TOLERANCES
A. Conform to ACI 117 (ACI 117M).

3.12 JOINT FILLING
A. Prepare, clean, and install joint filler in accordance with manufacturer's written instructions.
1. Defer joint filling until concrete has aged at least one month.
2. Do not fill joints until construction traffic has permanently ceased.
B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.
C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints.
D. Overfill joint, and trim joint filler flush with top of joint after hardening.

3.13 CONCRETE SURFACE REPAIRS
A. Defective Concrete:
1. Repair and patch defective areas when approved by Architect.
2. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.
C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension to solid concrete.
a. Limit cut depth to 3/4 inch (19 mm).
b. Make edges of cuts perpendicular to concrete surface.
c. Clean, dampen with water, and brush-coat holes and voids with bonding agent.
d. Fill and compact with patching mortar before bonding agent has dried.
e. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement, so that, when dry, patching mortar matches surrounding color.
a. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.
b. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance as determined by Architect.
D. Repairing Unformed Surfaces:

1. Test unformed surfaces, such as floors and slabs, for finish, and verify surface tolerances specified for each surface.
   a. Correct low and high areas.
   b. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
2. Repair finished surfaces containing surface defects, including spalls, popouts, honeycombs, rock pockets, crazing, and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
3. After concrete has cured at least 14 days, correct high areas by grinding.
4. Correct localized low areas during, or immediately after, completing surface-finishing operations by cutting out low areas and replacing with patching mortar.
   a. Finish repaired areas to blend into adjacent concrete.
5. Correct other low areas scheduled to receive floor coverings with a repair underlayment.
   a. Prepare, mix, and apply repair underlayment and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
   b. Feather edges to match adjacent floor elevations.
6. Correct other low areas scheduled to remain exposed with repair topping.
   a. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations.
   b. Prepare, mix, and apply repair topping and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
7. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete.
   a. Remove defective areas with clean, square cuts, and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around.
   b. Dampen concrete surfaces in contact with patching concrete and apply bonding agent.
   c. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate.
   d. Place, compact, and finish to blend with adjacent finished concrete.
   e. Cure in same manner as adjacent concrete.
8. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar.
   a. Groove top of cracks and cut out holes to sound concrete, and clean off dust, dirt, and loose particles.
   b. Dampen cleaned concrete surfaces and apply bonding agent.
   c. Place patching mortar before bonding agent has dried.
   d. Compact patching mortar and finish to match adjacent concrete.
   e. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.14 FIELD QUALITY CONTROL

A. Special Inspections: **Contractor** will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.

B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

1. Testing agency shall be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.
2. Testing agency shall immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
3. Testing agency shall report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.
    a. Test reports shall include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:
        1) Project name.
        2) Name of testing agency.
        3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
        4) Name of concrete manufacturer.
        5) Date and time of inspection, sampling, and field testing.
        6) Date and time of concrete placement.
        7) Location in Work of concrete represented by samples.
        8) Date and time sample was obtained.
        9) Truck and batch ticket numbers.
        10) Design compressive strength at 28 days.
        11) Concrete mixture designation, proportions, and materials.
        12) Field test results.
        13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.
        14) Type of fracture and compressive break strengths at seven days and 28 days.

C. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.

D. Inspections:

1. Headed bolts and studs.
2. Verification of use of required design mixture.
3. Concrete placement, including conveying and depositing.
4. Curing procedures and maintenance of curing temperature.
5. Verification of concrete strength before removal of shores and forms from beams and slabs.
6. Batch Plant Inspections: On a random basis, as determined by Architect.

E. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M shall be performed in accordance with the following requirements:

1. Testing Frequency: Obtain three composite samples for each class of concrete, for each 150 cubic yards or fraction thereof, for each day concrete is cast, or not less than once for each 5,000 sq ft of slab or wall area.
   a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
   b. See structural plans for further requirements.
2. Slump: ASTM C143/C143M:
   a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
   b. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete.
   a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C1064/C1064M:
   a. One test hourly when air temperature is 40 deg F (4.4 deg C) and below or 80 deg F (27 deg C) and above, and one test for each composite sample.
5. Unit Weight: ASTM C567/C567M fresh unit weight of structural lightweight concrete.
   a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
6. Compression Test Specimens: ASTM C 31.
   a. Cast and field cure three standard cylinder specimens for each composite sample.
7. Compressive-Strength Tests: ASTM C 39
   a. Test one field-cured cylinder at 7 days and two cylinders at 28 days.
   b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
11. Additional Tests:
    a. Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
    b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.

1) Acceptance criteria for concrete strength shall be in accordance with ACI 301 (ACI 301M), section 1.6.6.3.

12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

F. Measure floor and slab flatness and levelness in accordance with ASTM E1155 (ASTM E1155M) within 48 hours of completion of floor finishing and promptly report test results to Architect.

3.15 PROTECTION

A. Protect concrete surfaces as follows:
1. Protect from petroleum stains.
2. Diaper hydraulic equipment used over concrete surfaces.
3. Prohibit vehicles from interior concrete slabs.
4. Prohibit use of pipe-cutting machinery over concrete surfaces.
5. Prohibit placement of steel items on concrete surfaces.
6. Prohibit use of acids or acidic detergents over concrete surfaces.
7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.
8. Protect concrete surfaces scheduled to receive surface hardener or polished concrete finish using Floor Slab Protective Covering.

END OFSECTION

DIVISION 03 - CONCRETE
SECTION 033900 — CONCRETE CURE AND HARDENER

1. GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Application of water soluble. Inorganic hardening, sealing and dustproofing product for treatment of uncovered concrete floor surfaces.
B. Related Sections:
   1. Section 033000 – Cast-In-Place Concrete.

1.2 REFERENCES
A. Corps of Engineers Specification: CEGS 03300 4-79
B. ACI 308: Standard Specification for Curing Concrete

1.3 SUBMITTALS
A. Comply with Section 01100.
B. Product Data: Submit manufacturer's technical bulletins and MSDS on each product.
C. Quality Control Submittals:
   1. Provide protection plan of surrounding areas and non-cementitious surfaces.

1.4 QUALITY ASSURANCE
A. Comply with Section 011000.
B. Qualifications:
   1. Applicator: Experience in application of similar systems and products on projects of similar size and scope.
      a. Successful completion of a minimum of 3 projects of similar size and complexity to specified Work.
   2. Manufacturer Qualifications: Company shall be ISO 9001:2000 Certified.
   3. Manufacturer: Minimum 15 years of experience in manufacturing of surface hardener.
   4. A mock up or test installation is recommended.

1.5 DELIVERY, STORAGE AND HANDLING
A. Comply with Section 01100.
B. Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.
C. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
D. Store tightly sealed materials off ground and away from moisture, direct sunlight, extreme heat, and freezing temperatures.
E. Store in unopened packaging in clean, dry environment protected from sunlight at 40 degrees F (4 degrees C) to 85 degrees F (29 degrees C). Prevent material from freezing.

1.6 PROJECT CONDITIONS
A. Environmental Requirements:
   1. Ensure that substrate surface and ambient air temperature are minimum of 35 degrees F (minus 7 degrees C) and rising at application time and remain above 35 degrees F (minus 7 degrees C) for at least 24 hours after application. Ensure that frost or frozen surfaces are thawed and dry.
   2. Do not place surface hardener in areas without roof cover.
   3. Allow surfaces to attain temperature and conditions specified before proceeding with surface hardener application.

4. Perform Work of this Section in well-ventilated areas.

2. PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide products from the following manufacturer:
BASF Corporation
Construction Chemicals
889 Valley Park Drive
Shakopee, MN 55379
Customer Service: 800- 433-9517
Technical Service: 800-243-6739
Direct Phone: 952-496-6000
Internet: www.master-builders-solutions.BASF.us

B. Equal products: Prosoco Concrete Protector SB

C. Substitutions: Comply with Section 01 60 00.

D. Specifications and Drawings are based on manufacturer's proprietary literature from BASF Building Systems. Other manufacturers shall comply with minimum levels of material, color selection, and detailing indicated in Specifications or on Drawings. Architect will be sole judge of appropriateness of substitutions.

2.2 MATERIALS

A. Water soluble sealer/densifier, that when applied in accordance with manufacturers application recommendations will produce a dense surface resistant to abrasion, moisture, tire marking and provides added gloss to the floor finish.

1. VOC Content: None
2. Color: Clear.
3. Acceptable Product: MasterKure HD 200WD (was formerly Kure N Harden ®) by BASF Building Systems. Equal products will be considered.

3. EXECUTION

3.1 EXAMINATION

A. Comply with Section 01100.

3.2 SURFACE PREPARATION:

A. New Concrete

1. Properly finish freshly placed concrete surfaces. Surface is ready for application when it is damp but not wet and when it can no longer be marred by foot traffic.

3.3 APPLICATION

MasterKure HD 200WD ® is not a curing compound (film forming product), but should fully saturate the concrete surface for best results. Follow manufacturer's application recommendations. Acquire and review most current manufacturers published data. Including MSDS and warranty.

A. NEW CONCRETE (green concrete immediate application)

1. Apply undiluted MasterKure HD 200WD to finished, damp concrete surface with low pressure sprayer after all surface water has evaporated and the surface will not be marred or damaged by application procedures. Keep the treated surface area wet with product for thirty (30) minutes by spraying additional product and/or brooming excess material from low areas. Do not allow dry spots to occur. Prevent any drying of surface for twenty (20)-thrity (30) minutes.
2. As MasterKure HD 200WD begins to penetrate and react, mist the surface lightly with clean

water and brush, broom or power scrub with non-aggressive brush or pad into surface to aid penetration/reaction.

3. After thirty (30) minutes, depending on temperature and humidity, MasterKure HD 200WD will begin to gel. Keep all treated surfaces moist, and continue brushing/scrubbing action for 5-15 minutes. At this stage, the surface can be slippery. Use caution.
4. Flush the surface with water and squeegee the surface to remove excess material and all impurities present on the surface. Rinse with generous amounts of water to enhance product performance. Finish with a damp mop. MasterKure HD 200WD is environmentally safe and may be flushed directly into drains.
5. DO NOT allow MasterKure HD 200WD residue to dry on the surface. Any product allowed to dry on the surface may cause white residue that can be difficult to remove.

B. Existing Concrete (Cured)
1. For best results, apply to concrete cured seven (7) days or longer.
2. Assure surface is clean and free of contaminants (waxes, curing membrane, oil, etc).
3. Apply undiluted MasterKure HD 200WD to saturation level by sprayer, broom or squeegee.
4. Keep the treated surface area wet with product for thirty (30) minutes by spraying additional product and/or brooming excess material from low areas.
5. Do not allow dry spots to occur. Prevent any drying of surface for twenty (20)-thirty (30) minutes. Use brooms or floor scrubber with non-aggressive pad or brushes to aid in penetration.
6. After twenty (20)-thirty (30) minutes, depending on temperature and humidity, MasterKure HD 200WD will begin to gel. Keep all treated surfaces moist, and continue brushing/scrubbing action for 5-15 minutes. At this stage, the surface can be slippery. Use caution.
7. Flush the surface with water and squeegee the surface to remove excess material and all impurities present on the surface. Rinse with generous amounts of water to enhance product performance. Finish with a damp mop. MasterKure HD 200WD is environmentally safe and may be flushed directly into drains.
8. DO NOT allow MasterKure HD 200WD residue to dry on the surface. Any product allowed to dry on the surface may cause white residue that can be difficult to remove.

C. Drying Time
1. MasterKure HD 200WD penetrates in approximately thirty (30) –sixty (60) minutes depending on temperature and humidity. Allow each application to penetrate thoroughly before proceeding with additional applications.
2. Allow twenty four hours after application before opening to wheeled traffic.
3. Following drying, gloss development can be enhanced by buffing and or additional floor scrubbing.

3.4 CLEANING
A. Clean tools immediately after use with clean water. .
B. Clean up and properly dispose of debris remaining on Project site related to application.
C. Remove temporary coverings and protection from adjacent Work areas.

END OF SECTION

DIVISION 03 - CONCRETE
SECTION 033913 — CONCRETE SEALER
(For unstained concrete that will be exposed and have no flooring)

1. GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Water repellent sealer for interior concrete surfaces as scheduled.
B. Related Sections:
   1. Section 033000 – Cast-in-Place Concrete.

1.2 SUBMITTALS
A. Comply with Section 011000.
B. Product Data: Submit manufacturer's technical data sheets and LEED product information for each product.
C. Submit list of project references as documented in this Specification under Quality Assurance Article. Include contact name and phone number of person charged with oversight of each project.
D. Quality Control Submittals:
   1. Provide protection plan of surrounding areas and non-work surfaces.

1.3 QUALITY ASSURANCE
A. Comply with Section 01100.
B. Qualifications:
   1. Manufacturer Qualifications: Company with minimum 15 years of experience in manufacturing of specified products.
   2. Manufacturer Qualifications: Company shall be ISO 9001:2000 Certified.
   3. Applicator Qualifications: Company with minimum of 5 years experience in application of specified products on projects of similar size and scope, and is acceptable to product manufacturer.
      a. Successful completion of a minimum of 5 projects of similar size and complexity to specified Work.
C. Field Sample:
   1. Install at Project site or pre-selected area of building an area for field sample, as directed by Architect.
      a. Provide mockup of at least 100 sf (9.3 m2) to include surface preparation, sealant joint, and juncture details and allow for evaluation of repellent performance and finish.
      b. Conduct absorption test on cured field sample. Adjust application until required repellent performance is achieved.
      c. Apply material in accordance with manufacturer's written application instructions.
   2. Manufacturer's representative or designated representative will review technical aspects; surface preparation, application, and workmanship.
   3. Field sample will be standard for judging workmanship on remainder of Project.
   4. Maintain field sample during construction for workmanship comparison.
   5. Do not alter, move, or destroy field sample until Work is completed and approved by Architect.
   6. Obtain Architect's written approval of field sample before start of material application, including approval of aesthetics, color, texture, and appearance.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with Section 01100.
B. Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.
C. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
D. Store in unopened containers in clean, dry area between 35 degrees F (2 degrees C) and 110 degrees F (43 degrees C).

1.5 PROJECT CONDITIONS

A. Environmental Requirements:
   1. Minimum application temperature is 20 degrees F (minus 7 degrees C) and rising.
   2. Do not apply in rain or when rain is expected within 4 hours. Do not apply above 96 degrees F (35 degrees C) or below 40 degrees F (4 degrees C) or when temperatures are expected to fall below 20 degrees F (minus 7 degrees C) within 12 hours.

2. PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide products from the following manufacturer:
   BASF Corporation
   Construction Chemicals
   889 Valley Park Drive
   Shakopee, MN 55379
   Customer Service: 800- 433-9517
   Technical Service: 800-243-6739
   Direct Phone: 952-496-6000
   Internet: www.master-builders-solutions.basf.us
B. Equal Products: Prosoco Consolideck LS CS
C. Substitutions: Comply with Section 011000. Equal products will be considered.
D. Specifications and Drawings are based on manufacturer's proprietary literature from BASF. Other manufacturers shall comply with minimum levels of material and detailing indicated in Specifications or on Drawings. Architect will be sole judge of appropriateness of substitutions.

2.2 MATERIALS

A. Clear, breathable, high-performance, 100 percent silane sealer for protecting new and existing concrete surfaces. Penetrates deeply, sealing out water, chloride ions, and acids, preventing damage from freeze/thaw cycles.
   1. Acceptable Product: MasterProtect H 1001 (formerly Hydrozo 100 plus) by BASF.
B. Sealer shall have the following minimum performance:
   1. Compliance: Alberta DOT, Type 1c.
   2. Silane Content by Weight: 100 percent.
   3. Penetration, average depth, depending upon substrate: 0.20 inch (5 mm).
   4. Surface Appearance after Application: Unchanged.
   5. Flash Point, SETA: Greater than 165 degrees F (62.7 degrees C).
   6. Waterproofing Repellency after Heavy Abrasion, Alberta DOT penetrating sealer, Type 1c, 0.35 w/c ratio: 83.5 percent.
   7. Water Weight Gain, NCHRP 244 Series II Cube Test:
      a. 250 sf per gal (6.1 m2/L): 90 percent reduction.
      b. 400 sf per gal (9.8 m2/L): 85 percent reduction.

8. Absorbed Chloride, NCHRP 244 Series II Cube Test:
   a. 250 sf per gal (6.1 m2/L): 96 percent reduction.
   b. 400 sf per gal (9.8 m2/L): 87 percent reduction.
9. Absorbed Chloride, NCHRP 244 Series IV Southern Climate: 98 percent reduction.
10. VOC Content:
    a. 3.05 lbs per gal (365 g/L), less water and exempt solvents.

3. EXECUTION

3.1 EXAMINATION

A. Comply with Section 01100.

3.2 SURFACE PREPARATION

A. Protection: Protect plant life and surfaces to remain uncoated during application. Use drop cloths or masking as required.
B. Prepare surfaces in accordance with manufacturer's instructions.
C. Verify substrate has properly cured. Surfaces shall be clean and structurally sound. Remove dust, dirt, oil, grease, chemical films, coatings and other contaminants before application.
D. Do not apply sealer if standing water is visible on surface to be treated.

3.3 APPLICATION

A. Apply sealer in accordance with manufacturer's instructions.
B. Stir material thoroughly before and during application.
C. Apply sealer with flooding action. Eliminate ponding.
D. Apply even distribution of sealer.

3.4 PROTECTION

A. Protect sealer from damage during construction.

END OF SECTION

DIVISION 04 - MASONRY
SECTION 040100 – MASONRY RESTORATION MORTARING

1. GENERAL

1.01 SECTION INCLUDES
A. Exterior repointing.

1.02 RELATED REQUIREMENTS
A. Section 079005 - Joint sealers

1.03 REFERENCE STANDARDS
A. ACI 530/530.1/ERTA - Building Code Requirements and Specification for Masonry Structures and Related Commentaries; 2011.
B. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2011.
C. ASTM C150/C150M - Standard Specification for Portland Cement; 2016.
D. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2006 (Reapproved 2011).
E. ACI 530.1/ASCE 6/TMS 602 - Specification for Masonry Structures; American Concrete Institute International; 2008.
F. IMIAWC (CW) - Recommended Practices & Guide Specifications for Cold Weather Masonry Construction; International Masonry Industry All-Weather Council; 1993.
G. IMIAWC (HW) - Recommended Practices & Guide Specifications for Hot Weather Masonry Construction; International Masonry Industry All-Weather Council; current edition.

1.04 GENERAL PURPOSE NOTE
A. The requirement of this masonry restoration work is to stabilize the existing masonry construction. Although it is understood that the restored building cannot have the exact consistency expected in new construction, the completed work shall not have areas that visibly stand out as being more or less restored. The contractor must carefully examine all existing masonry conditions and apply all applicable restoration procedures as specified.

1.05 SUBMITTALS
A. Mortar Analysis: Prior to performing any repointing or resetting of masonry, submit a mortar analysis report, performed as described in Section 1.06 - Quality Assurance. The mortar analysis should include descriptions of methodology, recommendations, and laboratory data.
B. Product Data: Submit product data for products specified in this section.
   1. Submit letters from manufacturers certifying that the products supplied to the Project conform to the product data information for the following products:
      a. Mortar mix. Submit exact description of mortar mix and components for each type of mortar. List proportions, brand name for manufactured items, and source for other items. Submit this after approval of sample panels and before actual work begins.

1.06 QUALITY ASSURANCE
A. Laboratory Testing: The contractor is responsible for obtaining a mortar analysis report. Engage a qualified mortar analyst to perform chemical mortar analysis.

1. Locations to be analyzed: Samples no smaller than 2" x 1" x depth of joint of original mortar material shall be taken from 3 locations for the purpose of mortar analysis.
2. Analysis to be performed: The analysis and report should include the following:
   a. Description of testing methodology. Testing should include, at minimum, the following:
      1) Visual examination of freshly exposed surface of intact mortar sample. Examination should include color matching to Munsell Color System (for Soils).
      2) Chemical analysis of crushed sample, commonly referred to as gravimetric analysis, to determine percent composition of fines, aggregate, and acid soluble binder.
      3) Visual examination of fines and aggregate to determine material composition of fines and appropriate modern match for historic aggregate.
   b. A record of test results.
   c. Determination of the historic mortar mix proportions, described as a ratio of volumes, as determined from testing and examination.
   d. Source for appropriate aggregate.
   e. Other comments and recommendations deemed appropriate for ensuring best possible match for historic mortar and its installation.

B. Mock-ups:
1. Contractor should be prepared, in expense and schedule, to supply multiple mock-ups until a finished product approved by Owner is achieved. This may include changes in texture, color, product, and technique. Whenever possible, preparation of mock-ups should include input from appropriate product representatives.
2. Minimum size of mock-up: 4 feet by 4 feet.
3. Mock-ups to be provided:
   a. Mortar pointing - only after approval of new mortar mix(es).
4. Approved samples may be incorporated into the permanent construction unless otherwise indicated.
   All other samples are to be removed prior to the completion of the project.

1.07 FIELD CONDITIONS

A. Protect materials during storage and construction from wetting by rain, snow, or ground water and from staining or intermixing from other materials.

B. Do not restore masonry when the air temperature is below 32 F. rising or below 40 F. falling, unless work is enclosed and heated. Do not erect masonry when temperature of masonry and masonry units is below freezing.

C. Protect work from freezing and atmospheric condensation (dew and frost) for at least 48 hours after construction. Protect work from rain, snow, and dirt. Cover top of masonry work when it is not being worked on.

D. If removal of old mortar makes the masonry more vulnerable to water entry, point such joints before the next rain is predicted or before the end of the day, whichever is sooner.

E. Scaffolding shall be installed self-supporting or supported so that damage to existing remaining construction does not occur.

2. PRODUCTS

2.01 MORTAR MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I; color as required to produce approved color sample.
   1. Not more than 0.60 percent alkali.

B. Hydrated Lime: ASTM C207, Type S.

C. Mortar Aggregate: ASTM C144.

D. Grout Aggregate: ASTM C404.

E. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M.

F. The above listed materials are subject to revision based on the results of the Masonry Analysis.

2.02 MORTAR MIXES

A. Proportions used in pointing and resetting of historic and replacement masonry shall be based on ratios determined by the Mortar Analysis (see Mortar Analysis above). Intent is to provide a mortar mix consistent with this historic mortar.

B. Measure materials with box, not shovel. Add water or latex as required to make plastic mix.

C. For pointing mortar, add just enough water to make a damp mixture and let stand 1 to 2 hours in a cool place. Remix with enough water to make a workable mix.

D. Do not use masonry cement unless it is composed of portland cement, lime, and pigments conforming to specified products listed above. If masonry cement conforming to the requirements listed above is used, submit product data for approval.

E. Mortar shall match existing mortar in color and texture and shall be no harder than the original mortar.
   "Existing mortar" means original mortar, not subsequent patching or repointing. Add white cement, dark cement, and pigment, and vary aggregate, as required to match existing mortar.

3. EXECUTION

3.01 MORTAR RESTORATION (REPOINTING)

A. General.
   1. Repointing is to be performed on exterior joints between stones where mortar or sealant is missing or loose (location of pieces can change if pushed or pulled).

B. Preparation.
   1. At sections to be repointed, remove loose mortar and sound mortar to a depth of 2 ½ times joint width or until consistently sound mortar is reached, whichever is greater. In no case shall the depth be less than ½".
      a. The newly created joint shall be squared off at both the back and the sides of the cut.
      b. Avoid damaging adjacent masonry, including cracks, chips, and cut marks. Damaged masonry is to be replaced at Contractor's expense if it is determined that it is damaged due to poor workmanship or carelessness.
      c. Do not cut the joint to a width greater than currently exists.

   2. Remove all exterior caulk used at masonry, including intersections at windows,

cornices, and between masonry pieces.

3. Mix mortar as specified above.

C. Application

1. Moisten joints before applying mortar. Avoid pooling of water.
2. Fill joints in layers no greater than ¼". Compact each layer with a narrow pointing tool, leaving a rough surface to create mechanical keying for the next layer. Apply the next layer once the previous layer is thumb-print hard. Do not allow layers to cure overnight between applications.
3. Final mortar joint profile is to be beaded to match historic joint. Shape to provide a slope to horizontal surfaces so as avoid creating a ledge for water to sit on.
4. Avoid cold joints in horizontal or other continuous joints. Extend day's work to natural terminations wherever possible and fill horizontal and vertical joints in the same area simultaneously to minimize cold joints.
5. Immediately remove any excess mortar on any surfaces.
6. Keep mortar moist for several days of curing.
7. Final cleaning should not be started until mortar has cured for thirty days.

END OF SECTION

DIVISION 05 – METALS
SECTION 054000 – COLD FORMED METAL FRAMING

1. GENERAL

1.1 SUMMARY
A. This Section includes the following:
   1. Exterior load-bearing wall framing.
   2. Interior load-bearing wall framing.
   3. Exterior non-load-bearing wall framing.

1.2 ACTION SUBMITTALS
A. Product Data: For each type of product and accessory indicated.
B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
   1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS
A. Qualification data.
B. Welding certificates.
C. Product test reports.
D. Research/evaluation reports.

1.4 QUALITY ASSURANCE
A. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements.
B. Welding: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code--Sheet Steel."
C. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
D. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."
   1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Truss Design."
   2. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."
E. Comply with AISI's "Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings."

2. PRODUCTS

2.1 MATERIALS
A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

2.2 LOAD-BEARING WALL FRAMING
A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: As indicated on drawings.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and same minimum base-metal thickness as steel studs.

C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, punched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 0.0428 inch (1.09 mm).
2. Flange Width: 1-5/8 inches (41 mm.

2.3 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 0.0428 inch (1.09 mm).
2. Flange Width: 1-5/8 inches (41 mm).

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and same minimum base-metal thickness as steel studs.

C. Vertical Deflection Clips: Manufacturer's standard bypass clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads.

E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.

2.4 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members, unless otherwise indicated.

B. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

C. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.

D. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

E. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

F. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.
1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

2.5 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A 780.

B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Shims: Load bearing, high-density multimonomer plastic, nonleaching.

D. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

3. EXECUTION

3.1 PREPARATION

A. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.

B. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

3.2 INSTALLATION, GENERAL

A. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.

B. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.

C. Install framing members in one-piece lengths.

D. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

E. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

F. Install insulation, specified in Division 07 Section "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

G. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

H. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.3 LOAD-BEARING WALL INSTALLATION

A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:

1. Anchor Spacing: As shown on Drawings.

B. Squarely seat studs against top and bottom tracks with gap not exceeding of 1/8 inch (3 mm) between the end of wall framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:

1. Stud Spacing: As indicated.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.

D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.

E. Align floor and roof framing over studs. Where framing cannot be aligned, continuously reinforce track to transfer loads.

F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.

G. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.
   1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings. Fasten jamb members together to uniformly distribute loads.
   2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.

H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.
   1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.

I. Install horizontal bridging in stud system, spaced as indicated. Fasten at each stud intersection.
   1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of 2 screws into each flange of the clip angle for framing members up to 6 inches (150 mm) deep.
   2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
   3. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

J. Install steel sheet diagonal bracing straps to both stud flanges, terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.

K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.4 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Space studs as follows:
   1. Stud Spacing: As indicated].

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
   1. Install single deflection tracks and anchor to building structure.
   2. Install double deflection tracks and anchor outer track to building structure.
   3. Connect vertical deflection clips to bypassing studs and anchor to primary building structure.

E. Install horizontal bridging in wall studs, spaced in rows indicated on Drawings. Fasten at each stud intersection.

1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches (305 mm) of single deflection track. Install a combination of flat, taut, steel sheet straps of width and thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
   a. Install solid blocking at centers indicated.
2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
3. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
4. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable curtain-wall-framing system.

3.5 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
B. Field and shop welds will be subject to testing and inspecting.
C. Testing agency will report test results promptly and in writing to Contractor and Architect.
D. Remove and replace work where test results indicate that it does not comply with specified requirements.
E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.6 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION

DIVISION 05 – METALS
SECTION 055200 - HANDRAILS AND RAILINGS

1. GENERAL

1.1 SUMMARY

A. Section includes steel pipe railings, balusters, channel supports, fittings, and handrails.

B. Related Sections:
1. Section 051200 – Structural Steel: Structural steel components providing support for railing.
2. Section 055100 - Metal Stairs and Ladders: Handrails other than those specified in this section.
3. Section 099000 - Paints and Coatings: Paint finish.

1.2 REFERENCES

A. ASTM A36/A36M - Carbon Structural Steel.

B. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.

C. SSPC - Steel Structures Painting Manual.

1.3 DEFINITIONS

A. Definitions in ASTM E 985 for railing-related terms apply to this section.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

A. Structural Performance of Handrails and Railing Systems: Design, engineer, fabricate, and install handrails and railing systems to comply with requirements of ASTM E 985 for structural performance based on testing performed in accordance with ASTM E 894 and E 935.

B. Structural Performance: Design, engineer, fabricate, and install the following metal fabrications to withstand the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections. Apply each load to produce the maximum stress in each respective component of each metal fabrication.
1. Top Rail of Guardrail Systems: Capable of withstanding the following loads applied as indicated:
   a. Concentrated load of 200 lb applied at any point non-concurrently, vertically downward, or horizontally.
   b. Uniform load of 50 lb per linear ft. applied non-concurrently, vertically downward or horizontally.
2. Handrails Not Serving as Top Rails: Capable of withstanding the following loads applied as indicated:
   a. Concentrated load of 200 lb applied at any point non-concurrently, vertically downward or horizontally.
   b. Uniform load of 50 lb per linear foot applied non-concurrently, vertically downward or horizontally.
3. lnfill Area of Guardrail Systems: Capable of withstanding a horizontal concentrated load of 50 lb applied to one sq. ft. at any point in the system including panels, intermediate rails balusters, or other elements composing the infill area.
   a. Above load need not be assumed to act concurrently with uniform horizontal loads on top rails of railing systems in determining stress on guard.

4. Glass infill panels where called for on plans and their support system: Shall be capable of withstanding the loads in note 3. above with a safety factor of 4.0 as outlined in IBC 2009, Section 2407.
5. Treads of Steel Stairs: Capable of withstanding a uniform live load of 100 lb per sq. ft. or a concentrated live load of 300 lb on a area of 4 sq. inches located in the center of the tread, whichever produces the greater stress.
6. Platforms of Steel Stairs: Capable of withstanding a uniform live load of 100 lb per sq. ft.

1.5 SUBMITTALS

A. Section 01330 - Submittal Procedures: Submittal requirements.
B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
C. Signed and sealed calculations prepared by a qualified registered professional engineer licensed in the state of Missouri shall be submitted for all rails. Submit sealed calculations with the shop drawings.

1.6 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

2. PRODUCT

2.1 HANDRAILS AND RAILINGS

A. Furnish materials in accordance with Drawings.

2.2 STEEL RAILING SYSTEM COMPONENTS

A. Channels: ASTM A36.
B. Pipe: ASTM A53, Grade B Schedule 40 or ASTM A500, Grade B (42ksi)
C. Fittings: Elbows, T-shapes, wall brackets, escutcheons; machined steel.
D. Mounting: brackets and flanges. Prepare backing plate for mounting in metal stud wall construction.
E. Exposed Fasteners: Flush countersunk screws or bolts; consistent with design of railing.
F. Splice Connectors: Steel welding collars.
G. Shop and Touch-Up Primer: SSPC 15, Type 1, red oxide.

2.3 FABRICATION

A. Fit and shop assemble components in largest practical sizes for delivery to site.
B. Fabricate components with joints tightly fitted and secured. Furnish spigots and sleeves to accommodate site assembly and installation.
C. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
D. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
E. Interior Components: Continuously seal joined pieces by continuous welds.
F. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
G. Accurately form components to suit stairs and landings, to each other and to building structure.
H. Accommodate for expansion and contraction of members and building movement without damage to connections or members.

3. EXECUTION

3.1 EXAMINATION

A. Section 01300 - Administrative Requirements: Coordination and project conditions.
B. Verify field conditions are acceptable and are ready to receive work.
C. Verify concealed blocking and reinforcement is installed and correctly located to receive wall mounted handrails.

3.2 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

3.3 INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortion or defects.
B. Anchor railings to structure as shown on Drawings.
C. Field weld as indicated on shop drawings. Touch-up welds with primer. Grind welds smooth.
D. Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.
E. Assemble with spigots and sleeves to accommodate tight joints and secure installation.

3.4 ERECTION TOLERANCES

A. Section 01400 - Quality Requirements: Tolerances.

END OF SECTION

DIVISION 06 – WOOD, PLASTICS AND COMPOSITES
SECTION 061000 - ROUGH CARPENTRY

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. General and Supplementary General Conditions
B. General Requirements
C. Finish Carpentry - Section 062000
D. Concrete Formwork - Section 031000
E. See the notes sheet on the structural plans for related specifications, required special inspections, and shop drawings & deferred submittals

1.2 STORAGE & PROTECTION

A. Store all wood items in protected areas. All materials used to be clean and new. All dimension lumber, plywood, etc., to be kept covered with polyethylene at all times to prevent weather damage.

1.3 STANDARDS

A. Lumber shall comply with the following grading rules: Southern Pine Inspection Bureau (SPIB), Western Wood Products Association (WWPA) and National Lumber Grades Authority (NLGA)
Product Standard PS 51 for hardwood plywood. Product Standard PS 1 for softwood plywood.
B. All lumber and plywood to have stamp indicating type, grade, and mill of an ALSC Board of Review Approved Agency.

2. PRODUCTS

2.1 ROUGH FRAMING & CARPENTRY

A. Dimension lumber to be No. 2 or better, kiln dried and free from warp that cannot be corrected in process of bolting or nailing. Furnish protection to finished materials if necessary during construction. Maximum moisture content of lumber shall not exceed 19%. All material shall be grade marked. CCA plates where against concrete floor.
B. See Structural Plans.

2.2 ROUGH HARDWARE

A. Provide all straps, reinforcement, jamb anchors, etc., as detailed or required. Bolt blocking as required.

3. EXECUTION

3.1 INSTALLATION

A. Build all rough wood items in place as shown or required. Provide anchorage to masonry, steel, concrete, wood, etc.

END OF SECTION

DIVISION 06 – WOOD, PLASTICS AND COMPOSITES
SECTION 061600 - SHEATHING

GENERAL

1.1 RELATED DOCUMENTS
- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. See the notes sheet on the structural plans for related specifications, required special inspections, and shop drawings & deferred submittals.

1.2 SUMMARY
- A. This Section includes the following:
  1. Wall sheathing.
  2. Roof sheathing.

1.3 SUBMITTALS
- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
  1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
  2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
  3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
  4. For building wrap, include data on air-/moisture-infiltration protection based on testing according to referenced standards.
- B. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
  1. Preservative-treated plywood.

1.4 DELIVERY, STORAGE, AND HANDLING
- A. Stack plywood and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

2. PRODUCTS

2.1 WOOD PANEL PRODUCTS, GENERAL
- A. Plywood: Either DOC PS 1 or DOC PS 2, unless otherwise indicated.
- B. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
- C. Factory mark panels to indicate compliance with applicable standard.

2.2 PRESERVATIVE-TREATED PLYWOOD
- A. Preservative Treatment by Pressure Process: AWPA C9.
  1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Mark plywood with appropriate classification marking of an inspection agency

acceptable to authorities having jurisdiction.

C. Application: Treat all plywood, unless otherwise indicated.

2.3 WALL SHEATHING

A. Plywood Wall Sheathing: Exterior APA rated sheathing.
   1. APA Span Rating: Not less than 24/0.
   2. Nominal Thickness: Not less than 7/16 inch.

2.4 ROOF SHEATHING

A. Plywood Roof Sheathing: Exterior, APA rated sheathing.
   1. APA Span Rating: Not less than 32/16.
   2. Nominal Thickness: Not less than 5/8 inch.

2.5 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
   1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening Gypsum Sheathing to Wood Stud Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

3. EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction, unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:
   1. NES NER-272 for power-driven fasteners.
   2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."

D. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

E. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

A. General: Comply with applicable recommendations in APA Form No. E30S, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated below:

1. Wall and Roof Sheathing: As indicated on the plans

a. Nail to wood framing.

b. Space panels 1/8 inch apart at edges and ends.

END OFSECTION

DIVISION 06 – WOOD, PLASTICS AND COMPOSITES
SECTION 062000 – FINISH CARPENTRY

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. General and Supplementary General Conditions
B. General Requirements
C. Rough Carpentry - Section 061000

2. PRODUCTS

2.1 INTERIOR TRIM & WOODWORK

A. Moldings - WP or Fir - square edge wood members - Other miscellaneous pieces as required to trim out wood to masonry edges.

2.2 EXTERIOR TRIM

A. Moldings - Square edge moldings of white pine or fir as required to trim out wood to masonry edges.

3. INSTALLATION

3.1 INSTALLATION

A. All pieces and panels to be cut square to bearings, closely fitted, accurately set to required lines and levels rigidly secured in place.

END OF SECTION

DIVISION 06 – WOOD, PLASTICS AND COMPOSITES
SECTION 062200 - MILLWORK

1. SCOPE

1.1 This Contractor to furnish all material and labor necessary to complete the work as indicated on drawings and specified herein as millwork.

1.2 Finish carpentry and millwork will consist of installation of finished wood, hanging all doors, setting all frames, setting all finish hardware and all other finished millwork as required to complete this section of the specification.

2. MATERIALS

2.1 WOOD SHELVING

A. All shelving shall be constructed of 3/4" particle board with white Melamine finish with face banding. Shelving to be of adequate size to support span as shown.

2.2 WOOD TRIM

A. Interior: All wood trim and other finished trim shall be stained and varnished oak.

B. Exterior: All wood trim as shown and detailed shall be clear white pine to be finished as directed by Architect.

2.3 EXTERIOR PLYWOOD

A. Exterior plywood shall be exterior grade with joints sanded and butted neatly together.

B. Plywood where noted shall be resin faced plywood equal to U.S. Plywood "Duraply" installed in complete accordance with manufacturer's recommendations.

3. EXECUTION

3.1 Furnish and fit all interior finish in the very best manner, hand sanding any rough places and using the proper number and size of nails which must be set ready to be finished by Painting Contractor.

3.2 No hammer-scarred, butchered work will be accepted.

3.3 All finish work shall be of size and design as indicated on drawings.

3.4 Joints and rough edges shall be sanded smooth ready for painting.

3.5 Moldings shall be true in details, cleanly cut and sharp and machine sanded ready for finish.

3.6 Visible nails shall be set and filled.

3.7 The Millwork Contractor will check the job to be sure that all assemblies will go through the doors as shown. All units shall be broken down into sizes to pass through openings.

3.8 Work under this section shall be performed by a skilled contractor and shall be subject to final approval by the Architect.

4. FINAL

4.1 The Millwork Contractor shall submit shop drawings for approval of the Architect before work is started.

END OF SECTION

DIVISION 06 – WOOD, PLASTICS AND COMPOSITES
SECTION 064116 — PLASTIC LAMINATE CABINETS

1. GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Plastic-laminate-faced architectural cabinets.
   2. Plastic Laminate Shelving
   3. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets unless concealed within other construction before cabinet installation.

B. Related Requirements:
   1. Section 061053 "Miscellaneous Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets and concealed within other construction before cabinet installation.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product[, including panel products, high-pressure decorative laminate, adhesive for bonding plastic laminate, and cabinet hardware and accessories.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
   1. Show details full size.
   2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
   3. Show locations and sizes of cutouts and holes for plumbing fixtures and other items installed in architectural plastic-laminate cabinets and countertops
   4. Apply WI Certified Compliance Program label to Shop Drawings.

C. Samples for Initial Selection:
   1. Plastic laminates.
   2. PVC edge material.

D. Samples for Verification:
   1. Plastic laminates, for each type, color, pattern, and surface finish, with one sample applied to core material and specified edge material applied to one edge.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and fabricator.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in- service performance.

B. Installer Qualifications: Fabricator of products

C. Testing Agency Qualifications: For testing agency providing classification marking for fire- retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver cabinets and countertops until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install cabinets or countertops until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where cabinets and countertops are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.

C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.8 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that cabinets and countertops can be supported and installed as indicated.

2. PRODUCTS

2.1 ARCHITECTURAL CABINET FABRICATORS

A. Fabricators: Subject to compliance with requirements, available fabricators offering products that may be incorporated into the Work.

2.2 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.

B. Grade: Premium

C. Cabinet, Door, and Drawer Front Interface Style: Flush overlay

D. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.

E. Laminate Cladding for Exposed Surfaces:

1. Horizontal Surfaces: Grade HGS
2. Vertical Surfaces: Grade HGS

3. Edges: Grade HGS or PVC edge banding, 0.12 inch thick, matching laminate in color, pattern, and finish.
4. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels.

F. Materials for Semiexposed Surfaces:
1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, NEMA LD 3, Grade HGS or Thermoset decorative panels.
a. Edges of Plastic-Laminate Shelves: PVC edge banding, 0.12 inch thick, matching laminate in color, pattern, and finish.
b. Edges of Thermoset Decorative Panel Shelves: PVC or polyester edge banding.
c. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, NEMA LD 3, Grade HGS.
2. Drawer Sides and Backs: Solid-hardwood lumber or Thermoset decorative panels with PVC or polyester edge banding.
3. Drawer Bottoms: Hardwood plywood or Thermoset decorative panels.

G. Dust Panels: 1/4-inch plywood or tempered hardboard above compartments and drawers unless located directly under tops.

H. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.

I. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.

J. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
1. Colors and Patterns to be selected by owner. Also see drawings and finish schedule.

2.3 WOOD MATERIALS

A. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
1. Medium-Density Fiberboard: ANSI A208.2, Grade MD
2. Particleboard: ANSI A208.1, Grade M-2. Grade M-2-Exterior Glue at sinks.
3. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1.
4. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.

2.4 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets.

B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 135 degrees of opening.

C. Back-Mounted Pulls: BHMA A156.9, B02011.

D. Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16 inch in diameter.

E. Catches: Magnetic catches, BHMA A156.9, B03141.

F. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.

G. Drawer Slides: BHMA A156.9.
   1. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-extension type; zinc-plated-steel ball-bearing slides.
   2. For drawers more than 3 inches high but not more than 6 inches high and not more than 24 inches wide, provide Grade 1HD-100.
   3. For drawers more than 6 inches high or more than 24 inches wide, provide Grade 1HD- 200.

H. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
   1. Satin Stainless Steel: BHMA 630.

I. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.5 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber kiln dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

2.6 FABRICATION

A. Fabricate cabinets to dimensions, profiles, and details indicated.

B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
   1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
   2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.

C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

D. Fabricate countertops to dimensions, profiles, and details indicated. Provide front and end overhang of 1 inch over base cabinets.

3. EXECUTION

3.1 PREPARATION

A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.

B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required.

3.2 INSTALLATION

A. Grade: Install cabinets to comply with same grade as item to be installed.

B. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.

1. Provide cutouts for appliances, plumbing fixtures, electrical work, and similar items.
2. Seal edges of cutouts by saturating with varnish.

C. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.

D. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.

1. Use filler matching finish of items being installed.

F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips.

G. Touch up finishing work specified in this section after installation of cabinets. Fill nail holes with matching filler where exposed.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean cabinets on exposed and semiexposed surfaces.

END OF SECTION

DIVISION 06 – WOOD, PLASTICS AND COMPOSITES
SECTION 066116 — SOLID SURFACE FABRICATIONS

1. GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following horizontal and trim solid surface product types:
   1. **Window Stools** –1/2" thick x sill depth plus 1/2" – eased exposed top edge.
   2. **Lavatory Countertops** – See Interior Elevations

B. Related Sections include the following:
   1. Division 6 Section "Rough Carpentry" for Blocking.

1.3 DEFINITION

A. Solid surface is defined as nonporous, homogeneous material maintaining the same composition throughout the part with a composition of acrylic polymer, aluminum trihydrate filler and pigment.

1.4 SUBMITTALS

A. Product data:
   1. For each type of product indicated.

B. Shop drawings:
   1. Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices and other components.
      a. Show full-size details, edge details, thermoforming requirements, attachments, etc.
      b. Show locations and sizes of furring, blocking, including concealed blocking and reinforcement specified in other Sections.
      c. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, waste receptacle and other items installed in solid surface.

C. Samples:
   1. For each type of product indicated.
      a. Submit minimum 6-inch by 6-inch sample in specified gloss.
      b. Cut sample and seam together for representation of inconspicuous seam.
      c. Indicate full range of color and pattern variation.
   2. Approved samples will be retained as a standard for work.

D. Product data:
   1. Indicate product description, fabrication information and compliance with specified performance requirements.

F. Product certificates:
   1. For each type of product, signed by product manufacturer.

G. Fabricator/installer qualifications:
   1. Provide copy of certification number.

H. Manufacturer certificates:
   1. Signed by manufacturers certifying that they comply with requirements.

I. NSF/ANSI standards:
   1. Refer to www.nsf.org for the latest compliance to NSF/ANSI Standard 51 for food zone — all food types.

J. Maintenance data:
   1. Submit manufacturer's care and maintenance data, including repair and cleaning instructions.
      a. Maintenance kit for finishes shall be submitted.
   2. Include in project closeout documents.

1.5 QUALITY ASSURANCE

A. Qualifications:
   1. Shop that employs skilled workers who custom fabricate products similar to those required for this project and whose products have a record of successful in-service performance.

B. Fabricator/installer qualifications:
   1. Work of this section shall be by a certified fabricator/installer, certified in writing by the manufacturer.

C. Applicable standards:
   1. Standards of the following, as referenced herein:
      a. American National Standards Institute (ANSI)
      b. American Society for Testing and Materials (ASTM)
      c. National Electrical Manufacturers Association (NEMA)
      d. NSF International
   2. Fire test response characteristics:
      a. Provide with the following Class A (Class I) surface burning characteristics as determined by testing identical products per UL 723 (ASTM E84) or another testing and inspecting agency acceptable to authorities having jurisdiction:
         1) Flame Spread Index: 25 or less.
         2) Smoke Developed Index: 450 or less.

E. Drawings shall:
   1. Be produced in 1/2-inch scale for all fabricated items.

F. Drawings must be complete and submitted to the architect within 60 days after award of contract for record only.
   1. No review or approval will be forthcoming.
   2. Coordination drawings are required for the benefit of contractor's fabricators/installers as an aid to coordination of their work so as to eliminate or reduce conflicts that may arise during the installation of their work.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver no components to project site until areas are ready for installation.

B. Store components indoors prior to installation.

C. Handle materials to prevent damage to finished surfaces.

   1. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.7 WARRANTY

A. Provide manufacturer's warranty against defects in materials.

1. Warranty shall provide material and labor to repair or replace defective materials.

2. Damage caused by physical or chemical abuse or damage from excessive heat will not be warranted.

B. Optional Installed Warranty:

1. To qualify for the optional Installed Warranty, fabrication and installation must be performed by a DuPont Certified Fabrication/Installation source who will provide a brand plate for the application.

2. This warranty covers all fabrication and installation performed by the certified/approved source subject to the specific wording contained in the Installed Warranty Card.

C. Manufacturer's warranty period:

1. Ten years from date of substantial completion.

1.8 MAINTENANCE

A. Provide maintenance requirements as specified by the manufacturer.

2. PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:

1. Subject to compliance with requirements, provide products by one of the following:

a. Corian® surfaces from the DuPont company (basis of design).

b. Wilsonart, Formica considered equal.

c. Substitutions considered.

2.2 MATERIALS

A. Solid polymer components

1. Cast, nonporous, filled polymer, not coated, laminated or of composite construction with through body colors meeting ANSI Z124.3 or ANSI Z124.6, having minimum physical and performance properties specified.

2. Superficial damage to a depth of 0.010 inch (.25 mm) shall be repairable by sanding and/or polishing.

B. Thickness:

1. 1 inch

C. Edge treatment:

1. Top exposed edge to be eased.

Performance characteristics:

Property	**Typical Result**	**Test**
Tensile Strength	6,000 psi	ASTM D 638
Tensile Modulus	1.5 x 10-6 psi	ASTM D 638
Tensile Elongation	0.4% min.	ASTM D 638
Flexural Strength	10,000 psi	ASTM D 790
Flexural Modulus	1.2 x 10-6 psi	ASTM D 790
Hardness	>85	Rockwell "M" Scale ASTM D 785

	56	Barcol Impressor ASTM D 2583
Thermal Expansion	3.02 x 10-5 in./in./°C (1.80 x 10-5 in./in./°F)	ASTM D 696
Gloss (60° Gardner)	5–75 (matte—highly polished)	ANSI Z124
Light Resistance	(Xenon Arc) No effect	NEMA LD 3-200 Method 3.3
Wear and Cleanability	Passes	ANSI Z124.3 & Z124.6
Stain Resistance: Sheets	Passes	ANSI Z124.3 & Z124.6
Fungus and Bacteria Resistance	Does not support microbial growth	ASTM G21&G22
Boiling Water Resistance	No visible change	NEMA LD 3-2000 Method 3.5
High Temperature Resistance Method 3.6	No change	NEMA LD 3-2000
Izod Impact (Notched Specimen)	0.28 ft.-lbs./in. of notch	ASTM D 256 (Method A)
Ball Impact Resistance: Sheets 1/2" slab—144" drop	No fracture—1/2 lb. ball: 1/4" slab—36" drop	NEMA LD 3-2000 Method 3.8
Weatherability	ΔE*94<5 in 1,000 hrs.	ASTM G 155
Specific Gravity †	1.7	
Water Absorption	Long-term 0.4% (3/4") 0.6% (1/2") 0.8% (1/4")	ASTM D 570
Toxicity	99 (solid colors) 66 (patterned colors)	Pittsburgh Protocol Test ("LC50"Test)
Flammability	All colors (Class I and Class A)	ASTM E 84, NFPA 255 & UL 723
Flame Spread Index	<25	
Smoke Developed Index	<25	

† Approximate weight per square foot: 1/4" (6 mm) 2.2 lbs., 1/2" (12.3 mm) 4.4 lbs.
Shapes meet or exceed the ANSI Z124.3 and ANSI Z124.6 standards for plastic sinks and lavatories.
NEMA results based on the NEMA LD 3-2000

2.3 ACCESSORIES

A. Joint adhesive:

1. Manufacturer's standard one- or two-part adhesive kit to create inconspicuous, nonporous joints.

B. Sealant:

1. Manufacturer's standard mildew-resistant, FDA-compliant, NSF 51-compliant (food zone — any type), UL-listed silicone sealant in colors matching components.

2.4 FACTORY FABRICATION

A. Shop assembly

1. Fabricate components to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer's

printed instructions and technical bulletins.

2. Form joints between components using manufacturer's standard joint adhesive without conspicuous joints.
   a. Reinforce with strip of solid polymer material, 2" wide.
3. Provide factory cutouts for plumbing fittings and bath accessories as indicated on the drawings.

4. Rout and finish component edges with clean, sharp returns.
   a. Rout cutouts, radii and contours to template.
   b. Smooth edges.
   c. Repair or reject defective and inaccurate work.

2.5 FINISHES

A. Select from the manufacturer's standard color chart.

B. Finish:
   1. Provide surfaces with a uniform finish.
      a. Matte; gloss range of 5–20.

3. EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with fabricator present for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.
   1. Provide product in the largest pieces available.
   2. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work.
      a. Exposed joints/seams shall not be allowed.
   3. Reinforce field joints with solid surface strips extending a minimum of 1 inch on either side of the seam with the strip being the same thickness as the top.
   4. Cut and finish component edges with clean, sharp returns.
   5. Rout radii and contours to template.
   6. Anchor securely to base cabinets or other supports.
   7. Align adjacent countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop.
   8. Carefully dress joints smooth, remove surface scratches and clean entire surface.
   9. Install countertops with no more than 1/8-inch (3 mm) sag, bow or other variation from a straight line.

B. Coved backsplashes and applied sidesplashes:
   1. Install applied sidesplashes using manufacturer's standard color-matched silicone sealant.
   2. Adhere applied sidesplashes to countertops using manufacturer's standard color-matched silicone sealant.

3.3 REPAIR

A. Repair or replace damaged work which cannot be repaired to architect's satisfaction.

3.4 CLEANING AND PROTECTION

A. Keep components clean during installation.

B. Remove adhesives, sealants and other stains.

END OF SECTION

DIVISION 06 – WOOD, PLASTICS AND COMPOSITE
SECTION 067300 – COMPOSITE DECKING

Part 1 General

1.1 Section Includes

A. Composite Decking (Trex Transcend and Trex Enhance)

1.2 Related Sections

A. Section 06-1100 – Wood Framing

1.3 References

A. ASTM D-7032-04: Standard Specification for Establishing Performance Ratings for Wood-Plastic Composite Deck Boards and Guardrail Systems (Guards or Handrails), ASTM International.
B. ASTM D-7031-04: Standard Guide for Evaluating Mechanical and Physical Properties of Wood-Plastic Composite Products, ASTM International
C. ASTM E-84-01: Test Method for Surface Burning Characteristics of Building Materials, ASTM International.
D. ASTM D 570: Water Absorption of Plastics
E. ASTM D 1761: Mechanical Fasteners in Wood
F. ASTM D -1413-99: Test method for Wood Preservatives by Laboratory Soil-block Cultures
G. ASTM C177: Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus

1.4 Design/Performance Requirements

A. Structural Performance:
    a. Deck: Uniform Load – 100lbf/sq.ft.
    b. Tread of Stairs: Concentrated Load: 750 lbf/sq.ft., and 1/8" max. deflection with a concentrated load of 300 lbf on area of 4 sq. in.
B. Fire-Test Response Characteristics per ASTM E-84.

1.5 Submittals

A. Product Data Indicate sizes, profiles, surface style, and performance characteristics
B. Samples: For each product specified, one sample representing actual product color, size, and finish.

1.6 Delivery, Storage, and Handling

A. Store Trex products on a flat and level surface. Adjust support blocks accordingly
B. Support Trex bundles on supplied dunnage
C. When stacking Trex bundles, supports should start approximately 8" from each end and be spaced approximately 2ft on center. Supports should line up vertically/perpendicular to the decking product.
D. Do not stack Trex Select decking more than 14 bundles.
E. Keep material covered using the provided bundle cover until time of installation.

F. See www. Trex.com for detailed storage recommendations;
   a. http://s7d4.scene7.com/is/content/Trex/Installation%20Guide%202013pdf

1.7 Warranty

A. Provide manufactures warranty against rot, decay, splitting, checking, splintering, fungal damage, and termite damage for a period of 25 years for a residential installation and 10 years for a commercial installation. In addition provide the Trex Transcend and Trex Enhance Fade and Stain Warranty against food staining and fading beyond 5 Delta E (CIE units) for a period of 25 years for a residential installation and 10 years for a commercial installation. Specific terms for warranties can be found at; www.Trex.com

Part 2 Products

2.1 Manufacturers

A. Contract Documents are based on products supplied by; Trex Company, Inc., 160 Exeter Dr., Winchester, VA 22603.
B. Substitutions: Equal Products will be considered.

2.2 Applications/Scope

A. Wood-Plastic Composite Lumber;
   a. Material Description: Composite Decking consisting of recycled Linear Low Density Polyethylene (LLDPE) and recycled wood. The product is extruded into shapes and sizes as follows:
      i. Trex Transcend and Trex Enhance Decking Boards; 1 x 5.5".
      ii. Lengths – 12, 16, and 20 feet
      iii. Color – To be specified by owner from Trex' standard list of colors.

   b. Physical and Mechanical Properties as follows:

Test	Test Method	Value	
Flame spread	ASTM E 84	60(Transcend) / 85(Enhance)	
Thermal Expansion	ASTM D 1037	1.9 x 10-5 inch/inch/degreeF	
Moisture Absorption	ASTM D 1037	< 1%	
Screw Withdrawal	ASTM D1761	558 lbs/in	
Fungus Resistance	ASTM D1413	Rating - no decay	
Termite Resistance	AWPAE1-72	Rating = 9.6	
		Ultimate (Typical)Values *	**Design Values**
Compression Parallel	ASTM D198	1588 psi	540 psi
Compression Perpendicular	ASTM D143	1437 psi	540 psi
Bending Strength	ASTM D198	3280 psi	500 psi
Shear Strength	ASTM D143	1761 psi	360 psi
Modulus of Elasticity	ASTM D4761	412,000psi	200,000 psi
Modulus of Rupture	ASTM D4761	3280 psi	500 psi

* Ultimate strength values are not meant for design analysis. Design values are for temperatures up to 130F (54C)

2.2 Accessories

A. Fasteners:
   a. Trex Universal Hideaway Hidden Fasteners
   b. Screws; See - http://s7d4.scene7.com/is/content/Trex/Installation%20Guide%202013pdf for the updated recommendations on fasteners.

Part 3 Execution

3.1 Installation
A. Install according to Trex installation guidelines. http://s7d4.scene7.com/is/content/Trex/Installation%20Guide%202013pdf
B. Cut, drill, and rout using carbide tipped blades
C. Do not use composite wood material for structural applications

3.2 Cleaning
A. Following cleaning recommendations as found in Trex installation guide at; http://s7d4.scene7.com/is/content/Trex/Installation%20Guide%202013pdf

END OF SECTION

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

SECTION 071100 – UNDER SLAB VAPOR BARRIER

1. GENERAL

1.1 SUMMARY

A. Products supplied under this section:
   1. Vapor retarder and installation accessories for installation under concrete slabs.

B. Related sections:
   1. Section 03 30 00 Cast-in-Place Concrete
   2. Section 07 26 00 Vapor Retarders

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM E1745- 11Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
   2. ASTM E1643- 11Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.

B. Technical Reference - American Concrete Institute (ACI):
   1. ACI 302.2R-06 Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.

1.3 SUBMITTALS

A. Quality control/assurance:
   1. Summary of test results per paragraph 9.3 of ASTM E1745.
   2. Manufacturer's samples and literature.
   3. Manufacturer's installation instructions for placement, seaming, penetration repair, and perimeter seal per ASTM E1643.
   4. All mandatory ASTM E1745 testing must be performed on a single production roll per ASTM E1745 Section 8.1.

2. PRODUCTS

2.1 MATERIALS

A. Vapor barrier shall have all the following qualities:
   1. Maintain permeance of less than 0.01 Perms [grains/(ft^2 · hr · inHg)] as tested in accordance with mandatory conditioning tests per ASTM E1745 Section 7.1 (7.1.1-7.1.5).
   2. Other performance criteria:
      a. Strength: ASTM E1745 Class A.
      b. Thickness: 15 mils minimum
   3. Provide third party documentation that all testing was performed on a single production roll per ASTM E1745 Section 8.1
   4. Warranty: (a) compliance with the designated ASTM E1745 classification, and (b) no manufacturing defects in the product for, at least, the Life of the Building.

B. Vapor barrier products:
   1. Basis of Design: Stego Wrap Vapor Barrier (15-mil) by Stego Industries LLC., (877) 464-7834 www.stegoindustries.com
   2. Approved Alternate: VaporGuard by Reef Industries, 713-507-4250. www.reefindustries.com.

3. Approved Alternate: Moistop Ultra15 by Fortifiber Building Systems Group. 800-773-4777. www.fortifiber.com.
4. Approved Alternate: Viper Vaporcheck II 15 mil by ISI Building Products. 866-698-6562. www.viper2.com.
5. Equal products will be considered.

2.2 ACCESSORIES

A. Seams :
1. Stego Tape by Stego Industries LLC

B. Penetrations of Vapor barrier:
1. Stego Mastic by Stego Industries LLC
2. Stego Tape by Stego Industries LLC

C. Perimeter/edge seal:
1. Stego Crete Claw by Stego Industries LLC
2. Stego Term Bar by Stego Industries LLC
3. StegoTack Tape (double sided) by Stego Industries LLC

3. EXECUTION

3.1 PREPARATION

A. Ensure that subsoil is approved by Architect or Geotechnical Engineer.
1. Level and compact base material.

3.2 INSTALLATION

A. Install vapor barrier in accordance ASTM E1643.
1. Unroll vapor retarder with the longest dimension parallel with the direction of the concrete placement and face laps away from the expected direction of the placement whenever possible.
2. Extend vapor retarder to the perimeter of the slab. If practicable, terminate it at the top of the slab, otherwise (a) at a point acceptable to the structural engineer or (b) where obstructed by impediments, such as dowels, waterstops, or any other site condition requiring early termination of the vapor retarder. At the point of termination, seal vapor retarder to the foundation wall, grade beam or slab itself.
Seal vapor retarder to the entire perimeter wall or footing/grade beam with double sided StegoTack Tape, or both Stego Term Bar and StegoTack Tape, per manufacturer's instructions. Ensure the concrete is clean and dry prior to adhering tape.
3. Overlap joints 6 inches and seal with manufacturer's seam tape.
4. Apply seam tape/Crete Claw to a clean and dry vapor retarder.
5. Seal all penetrations (including pipes) per manufacturer's instructions.
6. Avoid the use of non-permanent stakes driven through vapor retarder.
7. If non-permanent stakes are driven through vapor retarder, repair as recommended by vapor retarder manufacturer.
8. Repair damaged areas with vapor retarder material of similar (or better) permeance, puncture and tensile.

END OFSECTION

DIVISION 07 – THERMAL AND MOISTURE PROTECTION
SECTION 072117 - BUILDING INSULATION

1. GENERAL

1.1 SECTION INCLUDES
A. Batt and Roll Insulation.
B. Blowing Insulation.
C. Board Insulation.
D. Vapor Retarder.

1.2 RELATED SECTIONS
A. Section 048000 - Masonry Assemblies: Cavity wall and masonry cell insulation.
B. Section 072600 - Vapor Retarders: Vapor retarder materials to adjacent insulation.
C. Section 072700 - Air Barriers: Air seal materials to adjacent insulation.
D. Section 074800 - Exterior Wall Assemblies: Exterior Insulated Finish Systems EIFS.
E. Section 075000 - Membrane Roofing: Insulation in low-slope roofing applications.

1.3 REFERENCES
A. ASTM C 423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
B. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
C. ASTM C 553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
D. ASTM C 612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
E. ASTM C 665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
F. ASTM C 764 - Standard. Specification for Mineral Fiber. Loose-Fill Thermal Insulation.
G. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
H. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials.
I. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
J. ASTM E 136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C.
K. ASTM E 814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops.
L. Federal Specification HH-I-521F: Insulation Blankets, Thermal (Mineral Fiber, For Ambient Temperatures).
M. Federal Specification HH-I-558B: Insulation, Blocks, Blankets, Felts, Sleeving (Pipe and Tube Covering), and Pipe fitting Covering, Thermal (Mineral Fiber, Industrial Type)
N. National Fire Protection Association (NFPA) Life Safety Code
O. Underwriters Laboratories (UL) - UL 2079 Standard test method for fire resistance of Building Joint Systems.

1.4 SUBMITTALS
A. Submit under provisions of Section 013000.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer with a minimum of ten years experience manufacturing products in this section shall provide all products listed.

B. Installer Qualifications: Products listed in this section shall be installed by a single organization with at least five years experience successfully installing insulation on projects of similar type and scope as specified in this section.

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Finish areas designated by Architect.
   2. Do not proceed with remaining work until workmanship is approved by Architect.
   3. Refinish mock-up area as required to produce acceptable work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.

B. Storage: Store materials in dry locations with adequate ventilation, free from water, and in such a manner to permit easy access for inspection and handling.

C. Handling: Handle materials to avoid damage.

1.7 SEQUENCING

A. Coordinate with the installation of vapor retarders and air seal materials specified is Section 072600 and Section 072700.

B. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.8 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

2. PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: CertainTeed Corp., Insulation Group, which is located at: 750 E. Swedesford Rd. P. O. Box 860 ; Valley Forge, PA 19482-0860; Toll Free Tel: 800-233-8990; Fax: 610-341-7940; Email: request info; Web: certainteed.com/CertainTeed/Pro/Design+Professional/Insulation

B. Substitutions: Equal products will be considered.

2.2 APPLICATIONS

A. Exterior Stud Walls: Blown type.
   1. Thickness: As indicated on the Drawings.
   2. R-Value: 20 minimum.
   3. Vapor Retarder: Separate.

B. Attic/Ceiling Rafters: Blown type.
   1. Thickness: As indicated on the Drawings.
   2. R-Value: 40 minimum.
   3. Vapor Retarder: Separate.

C. Interior Partitions Indicated with STC Rating: Batt type.
   1. Thickness: As indicated on the Drawings.

2.3 BATT AND ROLL INSULATION

A. Acoustical/Thermal Insulation, Unfaced: Certainteed Sound Attenuation NoiseReducer Batts. Fiber glass building insulation for friction fit between steel studs. Complies with ASTM C 665; preformed glass fiber batt insulation. Fire Hazard Classification ASTM E84, Maximum Flame Spread Index of 25, Maximum Smoke Developed Index of 50, Noncombustable ASTM E 136, passes:
   1. Facing: ASTM C 665, Type 1, Unfaced.
      a. Thermal Resistance: R of 8 (RSI 1.4).
         1) Thickness: 2-12 inches (64 mm).
         2) Width: 16 inches (406 mm).

B. Acoustical/Thermal Batt Insulation, Certainteed CertaPro AcoustaTherm Batts. Complies with ASTM C 665; preformed glass fiber batt insulation.
   1. Unfaced: ASTM C 665, Type 1,.
      a. Fire Hazard Classification: ASTM E 84:
         1) Maximum Flame Spread Index; 5.
         2) Maximum Smoke Developed Index; 5.
      b. Noncombustibility: ASTM E 136, passes.
      c. Sizes:
         1) Thermal Resistance: R of 8 (RSI 1.41).
            a) Thickness: 2-12 inches (64 mm).
            b) Width: 16 inches (406 mm).
            c) Width: 24 inches (610 mm).

2.4 BLOWING INSULATION

A. Thermal Blowing Insulation: Certainteed Insulsafe SP Fiber Glass Blowing Insulation. Fiber glass blowing insulation for open attics, enclosed walls, and floor/ceilings assemblies. Complies with ASTM C 764; mineral fiber loose fill insulation Type 1, Pneumatic application:
   1. Fire Hazard Classification: ASTM E 84:
      a. Maximum Flame Spread Index; 5.
      b. Maximum Smoke Developed Index; 5.
   2. Noncombustibility: ASTM E 136, passes.
   3. Open Attic Application:
      a. Thermal Resistance: R of 38 minimum. Minimum Installed Thickness: 14.50 inches.
   4. Closed Cavity Application:
      a. Thermal Resistance: R of 22. Minimum Installed Thickness: 5.50 inches.

2.5 VAPOR RETARDER

A. Sheet Retarder: Certainteed MemBrain, The SMART Vapor Retarder. Polyimide film vapor retarder for use with unfaced, vapor permeable glass fiber and mineral wool insulation in wall and ceiling cavities. Material has a permeance of 1 perm or less when tested to ASTM E 86, dry cup method and increases to grater than 10 perms using the

wet cup method.

1. Water Vapor Permeance:
   a. ASTM E 86, dry cup method: 1.0 perms (57ng/Pa*s*m2).
   b. ASTM E 86, wet cup method: 10.0 perms (1144ng/Pa*s*m2).
2. Fire Hazard Classification: ASTM E 84:
   a. Maximum Flame Spread Index; 20.
   b. Maximum Smoke Developed Index; 55.

3. EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Verify that all exterior and interior wall, partition, and floor/ceiling assembly construction has been completed to the point where the insulation may correctly be installed.

C. Verify that mechanical and electrical services in ceilings, walls and floors have been installed and tested and, if appropriate, verify that adjacent materials are dry and ready to receive insulation.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in exterior spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within plane of insulation.

E. Install insulation with vapor barrier installed facing the warm side. Seal or tape joints as required.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

DIVISION 07 – THERMAL AND MOISTURE PROTECTION
SECTION 072700 – SHEET WEATHER BARRIERS

1. GENERAL

1.1 SECTION INCLUDES

A. Weather barrier membrane (DuPont™ Tyvek® CommercialWrap®)

B. Seam Tape (DuPont™ Tyvek® Tape)

C. Flashing (DuPont™ FlexWrap™, DuPont™ FlexWrap™ NF, DuPont™ StraightFlash™, DuPont™ StraightFlash™ VF, and/or DuPont™ Thru-Wall Flashing)

D. Fasteners (DuPont™ Tyvek® Wrap Caps)

1.2 REFERENCES

A. ASTM International

1. ASTM C920; Standard Specification for Elastomeric Joint Sealants
2. ASTM C1193; Standard Guide for Use of Joint Sealants
3. ASTM D882; Test Method for Tensile Properties of Thin Plastic Sheeting
4. ASTM D1117; Standard Guide for Evaluating Non-woven Fabrics
5. ASTM E84; Test Method for Surface Burning Characteristics of Building Materials
6. ASTM E96; Test Method for Water Vapor Transmission of Materials
7. ASTM E1677; Specification for Air Retarder Material or System for Framed Building Walls
8. ASTM E2178; Test Method for Air Permeance of Building Materials
9. ASTM E2357; Standard Test Method for Determining Air Leakage of Air Barrier Assemblies

B. AATCC – American Association of Textile Chemists and Colorists

1. Test Method 127 Water Resistance: Hydrostatic Pressure Test

C. TAPPI

1. Test Method T-410; Grams of Paper and Paperboard (Weight per Unit Area)
2. Test Method T-460; Air Resistance (Gurley Hill Method)

1.3 SUBMITTALS

A. Refer to Division 1 - General Procedure.

B. Product Data: Submit manufacturer current technical literature for each component.

C. Samples: Weather Barrier Membrane, minimum 8-1/2 inches by 11 inch.

D. Quality Assurance Submittals

1. Design Data, Test Reports: Provide manufacturer test reports indicating product compliance with indicated requirements.
2. Manufacturer Instructions: Provide manufacturer's written installation instructions.

1.4 QUALITY ASSURANCE

A. Qualifications

1. Installer shall have experience with installation of commercial weather barrier assemblies under similar conditions.
2. Installation shall be in accordance with weather barrier manufacturer's installation guidelines and recommendations.
3. Source Limitations: Provide commercial weather barrier and accessory materials produced by single manufacturer.

1.5 DELIVERY, STORAGE AND HANDLING

A. Refer to Division 1 - General Procedure.

B. Deliver weather barrier materials and components in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Store weather barrier materials as recommended by weather barrier manufacturer.

1.6 SCHEDULING

A. Review requirements for sequencing of installation of weather barrier assembly with installation of windows, doors, louvers and flashings to provide a weather-tight barrier assembly.

B. Schedule installation of weather barrier materials and exterior cladding within nine months of weather barrier assembly installation.

1.7 WARRANTY

A. General Warranty only – No special warranties.

2. PRODUCTS

2.1 MANUFACTURER

A. DuPont; 4417 Lancaster Pike, Chestnut Run Plaza 728, Wilmington, DE 19805; 1-800-44-TYVEK (8-9835); http://www.construction.tyvek.com

B. Equal products by other manufactures will be accepted.

2.2 MATERIALS

A. Basis of Design: spunbonded polyolefin, non-woven, non-perforated, weather barrier is based upon DuPont™ Tyvek® CommercialWrap® and related assembly components.

B. Performance Characteristics:

1. Air Penetration: 0.001 cfm/ft^2 at 75 Pa, when tested in accordance with ASTM E2178. Type I per ASTM E1677. $\leq$0.04 cfm/ft^2 at 75 Pa, when tested in accordance with ASTM E2357
2. Water Vapor Transmission: 28 perms, when tested in accordance with ASTM E96, Method B.
3. Water Penetration Resistance: 280 cm when tested in accordance with AATCC Test Method 127.
4. Basis Weight: 2.7 oz/yd^2, when tested in accordance with TAPPI Test Method T-410.
5. Air Resistance: Air infiltration at >1500 seconds, when tested in accordance with TAPPI Test Method T-460.

6. Tensile Strength: 38/35 lbs/in., when tested in accordance with ASTM D882, Method A.
7. Tear Resistance: 12/10 lbs., when tested in accordance with ASTM D1117.
8. Surface Burning Characteristics: Class A, when tested in accordance with ASTM E 84. Flame Spread: 10, Smoke Developed: 10.

2.3 ACCESSORIES

A. Seam Tape: 3 inch wide, DuPont™ Tyvek® Tape for commercial applications.

B. Fasteners:

1. Steel Frame Construction - DuPont™ Tyvek® Wrap Cap Screws, as distributed by DuPont: 1-5/8 inch rust resistant screw with 2-inch diameter plastic cap or manufacturer approved 1-1/4" or 2" metal gasketed washer
2. Wood Frame Construction
   Tyvek® Wrap Caps, as distributed by DuPont: #4 nails with large 1-inch plastic cap fasteners, or 1-inch plastic cap staples with leg length sufficient to achieve a minimum penetration of 5/8-inch into the wood stud.
3. Masonry Construction
   Masonry tap-con fasteners with Tyvek® Wrap Caps as distributed by DuPont: 2-inch diameter plastic cap fasteners.

C. Sealants

1. Provide sealants that comply with ASTM C920, elastomeric polymer sealant to maintain watertight conditions.
2. Products:
   a. DuPont™ Commercial Sealant
   b. DuPont™ Residential Sealant
   c. Sealants recommended by the weather barrier manufacturer.

D. Adhesives:

1. Provide adhesive recommended by weather barrier manufacturer.
2. Products:
   a. Liquid Nails® LN-109
   b. Denso Butyl Liquid
   c. 3M High Strength 90
   e. Adhesives recommend by the weather barrier manufacturer.

E. Primers:

1. Provide flashing manufacturer recommended primer to assist in adhesion between substrate and flashing.
2. Products:
   a. 3M High Strength 90
   b. Denso Butyl Spray
   c. Primers recommended by the flashing manufacturer

F. Flashing

1. DuPont™ FlexWrap™, as distributed by DuPont: flexible membrane flashing materials for window openings and penetrations.

2. DuPont™ Thru-Wall Surface Adhered Membrane with Integrated Drip Edge: Thru- Wall flashing membrane materials for flashing at changes in direction or elevation (shelf angles, foundations, etc.) and at transitions between different assembly materials.
3. Preformed Inside and Outside Corners and End Dams as distributed by DuPont: Preformed three-dimensional shapes to complete the flashing system used in conjunction with DuPont™ Thru-Wall Flashing.

3. EXECUTION

3.1 EXAMINATION

A. Verify substrate and surface conditions are in accordance with weather barrier manufacturer recommended tolerances prior to installation of weather barrier and accessories.

3.2 INSTALLATION – WEATHER BARRIER

A. Install weather barrier over exterior face of exterior wall substrate in accordance with manufacturer recommendations.

B. Install weather barrier prior to installation of windows and doors.

C. Start weather barrier installation at a building corner, leaving 6-12 inches of weather barrier extended beyond corner to overlap.

D. Install weather barrier in a horizontal manner starting at the lower portion of the wall surface with subsequent layers installed in a shingling manner to overlap lower layers. Maintain weather barrier plumb and level.

E. Sill Plate Interface: Extend lower edge of weather barrier over sill plate interface 3-6 inches. Secure to foundation with elastomeric sealant as recommended by weather barrier manufacturer.

F. Window and Door Openings: Extend weather barrier completely over openings.

G. Overlap weather barrier

1. Exterior corners: minimum 12 inches.
2. Seams: minimum 6 inches.

H. Weather Barrier Attachment:

1. Steel or Wood Frame Construction - Attach weather barrier to studs through exterior sheathing. Secure using weather barrier manufacturer recommended fasteners, space 12 -18 inches vertically on center along stud line, and 24 inch on center, maximum horizontally.
2. Masonry Construction - Attach weather barrier to masonry. Secure using weather barrier manufacturer recommended fasteners, spaced 12-18 inches vertically on center and 24 inches maximum horizontally. Weather barrier may be temporarily attached to masonry using recommended adhesive, placed in vertical strips spaced 24 inches on center, when coordinated on the project site.

I. Apply 4 inch by 7 inch piece of DuPont™ StraightFlash™ or weather barrier manufacturer approved alternate to weather barrier membrane prior to the installation cladding anchors.

3.3 SEAMING

A. Seal seams of weather barrier with seam tape at all vertical and horizontal overlapping seams.

B. Seal any tears or cuts as recommended by weather barrier manufacturer.

3.4 OPENING PREPARATION (for use with non-flanged windows – all cladding types)

A. Flush cut weather barrier at edge of sheathing around full perimeter of opening.

B. Cut a head flap at 45-degree angle in the weather barrier at window head to expose 8 inches of sheathing. Temporarily secure weather barrier flap away from sheathing with tape.

3.5 FLASHING (for use with non-flanged windows – all cladding types)

A. Cut 9 inch wide DuPont™ FlexWrap™ or DuPont™ FlexWrap™ NF a minimum of 12 inches longer than width of sill rough opening. Apply primer as required by manufacturer.

B. Cover horizontal sill by aligning DuPont™ FlexWrap™ edge with inside edge of sill. Adhere to rough opening across sill and up jambs a minimum of 6 inches. Secure flashing tightly into corners by working in along the sill before adhering up the jambs.

C. Fan DuPont™ FlexWrap™ at bottom corners onto face of wall. Firmly press in place. Mechanically fasten fanned edges. Mechanical fastening is not required for DuPont™ FlexWrap™ NF.

D. Apply 9-inch wide strips of DuPont™ StraightFlash™ at jambs. Align flashing with interior edge of jamb framing. Start DuPont™ StraightFlash™ at head of opening and lap sill flashing down to the sill.

E. Spray-apply primer to top 6 inches of jambs and exposed sheathing.

F. Install DuPont™ FlexWrap™ DuPont™ FlexWrap™ NF at opening head using same installation procedures used at sill. Overlap jamb flashing a minimum of 2 inches.

G. Coordinate flashing with window installation.

H. On exterior, install backer-rod in joint between window frame and flashed rough framing. Apply sealant at jambs and head, leaving sill unsealed. Apply sealants in accordance with sealant manufacturer's instructions and ASTM C 1193.

I. Position weather barrier head flap across head flashing. Adhere using 4-inch wide DuPont™ StraightFlash™ over the 45-degree seams.

J. Tape top of window in accordance with manufacturer recommendations.

K. On interior, install backer rod in joint between frame of window and flashed rough framing. Apply sealant around entire window to create air seal. Apply sealant in accordance with sealant manufacturer's instructions and ASTM C 1193.

3.6 OPENING PREPARATION (for use with flanged windows)

A. Cut weather barrier in an "I-cut" pattern. A modified I-cut is also acceptable.

1. Cut weather barrier horizontally along the bottom and top of the window opening.

2. From the top center of the window opening, cut weather barrier vertically down to the sill..

3. Fold side and bottom weather barrier flaps into window opening and fasten.

B. Cut a head flap at 45-degree angle in the weather barrier at window head to expose 8 inches of sheathing. Temporarily secure weather barrier flap away from sheathing with tape.

3.7 FLASHING (for use with flanged windows)

A. Cut 9-inch wide DuPont™ FlexWrap™ or DuPont™ FlexWrap™ NF a minimum of 12 inches longer than width of sill rough opening.

B. Cover horizontal sill by aligning DuPont™ FlexWrap™ edge with inside edge of sill. Adhere to rough opening across sill and up jambs a minimum of 6 inches. Secure flashing tightly into corners by working in along the sill before adhering up the jambs.

C. Fan DuPont™ FlexWrap™ at bottom corners onto face of wall. Firmly press in place. Mechanically fasten fanned edges. Mechanical fastening is not required for DuPont™ FlexWrap™ NF.

D. On exterior, apply continuous bead of sealant to wall or backside of window mounting flange across jambs and head. Do not apply sealant across sill.

E. Install window according to manufacturer's instructions.

F. Apply 4-inch wide strips of DuPont™ StraightFlash™ at jambs overlapping entire mounting flange. Extend jamb flashing 1-inch above top of rough opening and below bottom edge of sill flashing.

G. Apply 4-inch wide strip of DuPont™ StraightFlash™ as head flashing overlapping the mounting flange. Head flashing should extend beyond outside edges of both jamb flashings.

H. Position weather barrier head flap across head flashing. Adhere using 4-inch wide DuPont™ StraightFlash™ over the 45-degree seams.

I. Tape head flap in accordance with manufacturer recommendations.

J. On interior, install backer rod in joint between frame of window and flashed rough framing. Apply sealant around entire window to create air seal. Apply sealant in accordance with sealant manufacturer's instructions and ASTM C 1193.

3.8 THRU-WALL FLASHING INSTALLATION

A. Apply primer per manufacturer's written instructions.

B. Install preformed corners and end dams bedded in sealant in appropriate locations along wall.

C. Starting at a corner, remove release sheet and apply membrane to primed surfaces in lengths of 8 to 10 feet.

D. Extend membrane through wall and leave ¼ inch minimum exposed to form drip edge.

E. Roll flashing into place. Ensure continuous and direct contact with substrate.

F. Lap ends and overlap preformed corners 4 inches minimum. Seal all laps with sealant.

G. Trim exterior edge of membrane 1-inch and secure metal drip edge per manufacturer's written instructions.

H. Terminate membrane on vertical wall. [Terminate into reglet, counterflashing or with termination bar.]

I. Apply sealant bead at each termination.

3.9 THRU-WALL FLASHING / WEATHER BARRIER INTERFACE AT BASE OF WALL

A. Overlap thru-wall flashing with weather barrier by 6-inches.

B. Mechanically fasten bottom of weather barrier through top of thru-wall flashing.

C. Seal vertical and horizontal seams with tape or sealing membrane.

3.10 THRU-WALL FLASHING / WEATHER BARRIER INTERFACE AT SHELF ANGLE

A. Seal weather barrier to bottom of shelf angle with sealing membrane.

B. Apply thru-wall flashing to top of shelf angle. Overlap thru-wall flashing with weather barrier by 6-inches.

C. Seal bottom of weather barrier to thru-wall flashing with tape or sealing membrane.

3.11 THRU-WALL FLASHING / WEATHER BARRIER INTERFACE AT WINDOW HEAD

A. Cut flap in weather barrier at window head.

B. Prime exposed sheathing.

C. Install lintel as required. Verify end dams extend 4 inches minimum beyond opening.

D. Install end dams bedded in sealant.

E. Adhere 2 inches minimum thru-wall flashing to wall sheathing. Overlap lintel with thru-wall flashing and extend ¼ inch minimum beyond outside edge of lintel to form drip edge.

F. Apply sealant along thru-wall flashing edges.

G. Fold weather barrier flap back into place and tape bottom edge to thru-wall flashing.

H. Tape diagonal cuts of weather barrier.

I. Secure weather barrier flap with fasteners.

3.12 PROTECTION

A. Protect installed weather barrier from damage.

END OFSECTION

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

SECTION 076000 - SHEET METAL WORK PREFABRICATED

1. SCOPE

1.1 This Contractor shall provide all prefinished sheet metal work where shown on the plans, including all drains, downspouts, flashings, gravel guards, sheet metal work closures, trims, fascia's, through wall scuppers, conductor heads and all other work pertaining to sheet metal work.

MATERIAL

1.2 Shall be equal to Dimensional Metals Inc., Berridge, McElroy or Equal.

1.3 Sheet Materials

A. Prefinished metal shall be hot-dipped galvanized ASTM A446-85 Grade C G90 Coating A525-86 24 gauge core steel or prefinished Galvalume ASTM 792-86, with seams 24" o.c.

B. Finish shall be full strength Kynar 500 Fluoropolymer coating applied by the manufacturer on a continuous coil coating line, with a top side dry film thickness of 0.70 to 0.90 mil over 0.25 to 0.35 mil prime coat, to provide a total dry film thickness of 0.95 to 1.25 mil. Bottom side shall be coated with primer with a dry film thickness of 0.25 mil. Finish shall conform to all tests for adhesion, flexibility, and longevity as specified by the Kynar 500 finish supplier. Color of roof panel to be as selected by Architect.

C. Strippable film shall be liquid applied to the top side of the painted coil to protect the finish during fabrication, shipping and field handling. This strippable film must be removed installation.

2. INSTALLATION

2.1 Where shown on drawings install scuppers, leaders and leader heads with all joints between scupper roof flashing to be lapped, soldered and anchored with metal strips.

2.2 All flashing and counter flashing joints will be mitered, lapped and soldered, and anchored with galvanized metal clips.

2.3 All counter flashing on enclosed roof areas to extend not less than 8" above roof and will extend into wall and turn up as detailed on drawings.

3. SHOP DRAWINGS

3.1 This Contractor will furnish electronic copies of shop drawings for prefinished sheet metal to Architect.

END OF SECTION

DIVISION 07 – THERMAL AND MOISTURE PROTECTION
SECTION 078400 – FIRESTOPPING

1. GENERAL

1.1 DESCRIPTION

A. Section includes: Firestopping for the following.

1. Penetrations through fire resistance rated floor and roof construction including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
2. Penetrations through fire resistance rated walls and partitions including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
3. Penetrations through smoke barriers and construction enclosing compartmentalized areas involving both empty openings and openings containing penetrating items.
4. Sealant joints in fire rated construction.

B. Related work:

1. Sealants required or specified in other Sections.

1.2 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide firestopping systems produced and installed to resist the spread of fire and the passage of smoke and other gases in compliance with Code.

B. Comply with California Code of Regulations Title 24, CBC Chapter 7, Fire Tests of Through Penetration Fire Stops.

C. Underwriters Laboratories (UL) of Northbrook, IL runs ASTM E 814 under their designation of UL 1479 and publishes the resuits in their "Fire Resistance Directory" that is updated annually with a midyear supplement.

1. UL Fire Resistance Directory
   a. Through Penetration Fire Stop Devices (XHCR).
   b. Fire Resistance Rating (BXUV).
   c. Through Penetration Fire Stop Systems (XHEZ).
   d. Fill, Voids or Cavity Material (XHHW).
   e. Forming Materials (XHKU).

D. Test Requirements: UL 2079, "Tests for Resistance of Building Joint Systems" (November 1994).

1.3 SUBMITTALS

A. Procedure: In accordance with Section 011000.

B. Data: Manufacturer product data for all materials and prefabricated devices and manufacturer's installation instructions. Submitted material must be approved by Fire Marshal prior to installation.

C. Certification: Letter of certification, or certified laboratory test report that the material or combination of materials proposed for use meets the requirements specified in ASTM E 814, are so classified in UL Building Materials Directory, and are approved by the Building Department.

D. Evaluation reports: Evidence of fire resistive joint systems' compliance with ICBO Evaluation Service Acceptance Criteria AC30, from ICBO Evaluation Service.

E. Documentation:

1. Include illustrations, from a qualified testing and inspecting agency, applicable to each through penetration firestop configuration for construction and penetrating items.
2. Where Project conditions require modification of qualified testing and inspecting agency illustration to suit a particular through penetration firestop condition, obtain Fire Marshal acceptance of the modification prior to submitting shop drawings.

1.4 QUALITY ASSURANCE

A. Single source responsibility: Obtain through penetration firestop systems, for each kind of penetration and construction condition indicated, from a single manufacturer.

B. Applicator's Qaulifications: Company specializing in performing work of this section, with a minimum of 5 years experience who specializes in the installation of firestop products. Personnel shall be certified, licensed, or otherwise qualified by firestopping manufacturer as having been provided necessary training to select and install products according to manufacturer's requirements. Company must be Factory Mutual Approved.

C. Compatibility: Provide firestop systems compatible with one another and with substrates under conditions of application and service.

D. A manufacturer's direct representative (not distributor or agent) to be on site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures. This will be done per manufacturer's written recommendations published in their literature and drawing details.

E. Firestop system installation, must meet requirements of ASTM E 814, UL 14'S or UL 2079 tested assemblies that provide a fire rating equal to that of construction being penetrated.

F. For those firestop applications that exist for which no UL tested system is available through any manufacturer, a manufacturer's engineering judgement derived from similar UL system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineer judgement drawings must follow requirements set forth by She International Firestop Councii (September 7, 1994).

1.5 HANDLING

A. Storage: Store and handle materials to prevent their deterioration or damage. Do not use damaged and contaminated materials.

2. PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with through penetration firestop systems (XHEZ) listed in Volume II of the UL Fire Resistance Directory, provide products of one or a combination of the following, as required by condition of use:

1. Hilti Construction Chemicais, Inc. Tulsa, OK, telephone 918.252.6901.
2. Tremco Inc. Beachwood, OH, telephone 216.292.5000.
3. 3M Fire Protection Products. St. Paul, MN, telephone 612.736.0203.

2.2 MATERIALS

A. All through penetrations shall be labeled on both sides of the wall to indicate the appropriate UL system number, product used, installation date, hour rating installer, location number and telephone contact for the corresponding manufacturer. Material installed shail be as required for installation conditions and to achieve the required fire resistance.

B. Use only firestop products that have been UL 1479, ASTM E 814, or UL2079 tested for specific fire rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire rating involved for each separate instance.

C. For penetrations by non combustible items including steel pipe, copper pipe, rigid steel conduit and electrical metallic tubing (EMT), the following materials are acceptable:

1. Hilti FS 601 Elastomeric Firestop Sealant
2. Hilti FS ONE High Performance Intumescent Firestop Sealant
3. 3M Fire Stop Sealant 2000 4. 3M Fire Barrier CP25 WB
4. Tremco Tremstop Fyre Sil Sealant

D. For fire rated construction joints and other gaps, the following materials are acceptable:

1. Hilti FS 601 Elastomeric Firestop Sealant
2. Hilti CP 601 s Elastomeric Firestop Sealant.
3. Hilti CP 606 Flexible Firestop Sealant.
4. Hilti CP 672 Firestop Joint Spray
5. 3M Firestop Sealant 2000
6. Tremco Tremstop Fyre Sil Sealant

E. For penetrations by combustible items (penetrants consumed by high heat aflame) insulated metal pipe, PVC jacketed, flexible cable or cable bundles and plastic pipe (closed piping systems) the following materials are acceptable:

1. Hilti FS ONE High Performance Intumescent Firestop Sealant
2. Hilti CP 618 Firestop Putty
3. Hilti CP 642 Firestop Jacket
4. Hilti CP 643 Firestop Jacket
5. 3M Fire Barrier CP25 WB
6. 3M Fire Barrier FS 195 Wrap/Strip
7. Tremco Tremstop WBM Intumescent Firestop Sealant

F. For penetrations by combustible plastic pipe (open piping systems), the following are acceptable:

1. Hilti CP 642 Firestop Jacket
2. Hilti CP 643 Firestop Jacket
3. Hilti FS ONE High Performance Intumescent Firestop Sealant
4. 3M Fire Barrier PPO Plastic Pipe Device

G. For large size/complex penetrations made to accommodate cable trays, multiple steel and copper pipes, electrical busways in raceways' the following materials are acceptable:

1. Hilti FS 635 Trowelable Firestop Compound
2. Hilti FIRE BLOCK
3. 3M Firestop Foam 2001
4. 3M Fire Barrier CS 195 Composite Sheet

H. For openings between structurally separate sections of wall and floors. Top of walls, the following materials are acceptable:
   1. Hilti FS 60t Elastomeric Firestop Sealant
   2. Hilti CP 601s Elastomeric Firestop Sealant
   3. Hilti CP 606 Flexible Firestop Sealant
   4. Hilti FS ONE High Performance Intumescent Firestop Sealant
   5. 3M Fire Barrier CP 25 WB

I. Provide a firestop system with a "F" Rating as determined by UL 1479 or ASTM E814 which is equal to the time rating of construction being penetrated.

J. Provide a firestop system with an Assembly Rating as determined by UL 2079 which is equal to the time rating of construction being penetrated.

K. Firestopping at Electrical Vboxes and Utility Outlets.
   1. Hilti CP 618 Firestop Putty Stick
   2. Hilti CP 617 and CP 617L Firestop Putty Pad

L. For voids created at the intersection of the exterior wall assemblies (curtain wall) and rated floor assembly, the following material is acceptable:
   1. 3M Fire Barrier Spray and Thermafiber Safing (No equal)

M. For pipe penetrations of cast in place concrete floors and concrete over metal decking the following material is acceptable:
   1. Hilti CP 680 Cast In Firestop Device (No equal)

3. EXECUTION

3.1 PREPARATION

A. Verify conditions and measurements affecting the work of this Section at site. Make sure that detrimental conditions are corrected before proceeding with installation.

3.2 INSTALLATION

A. Install materials in compliance with their manufacturer's instructions and the printed instructions of UL Fire Resistance Directory.

B. Masking:
   1. Use masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed and that would be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestopping materials.
   2. Remove tape as soon as it is possible to do so without disturbing firestopping's seal with substrates.

3.3 IDENTIFICATION

A. Identify firestopping with pressure sensitive, self adhesive preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestopping installation where the labels will be visible to anyone seeking to remove penetrating items or firestopping. Include the foliowing information on the labels:
   1. The words: "WARNING FIRESTOPPING DO NOT DISTURB. NOTIFY BUILDING MANAGEMENT OF ANY DAMAGE"
   2. Contractor's name, address and phone number.
   3. Firestopping system designation of applicable testing and inspecting agency.

4. Date of installation.
5. Firestopping manufacturer's name.
6. Installer's name.

3.4 CLEANING

A. Clean up spills of liquid components.

B. Cut and trim excess materials neatly, flush with adjacent surfaces.

END OF SECTION

DIVISION 07 – THERMAL AND MOISTURE PROTECTION
SECTION 079000 - CAULKING & SEALANTS

1. GENERAL

1.1 SECTION INCLUDES

A. Exterior materials sealants.
B. Exterior Metal Surfaces sealants
C. Interior sealants.
D. Exterior and interior polyether traffic sealants.
E. Interior sanitary silicone sealants.
F. Threshold and sheet metal bedding sealants.
G. Joint accessories.

1.2 RELATED SECTIONS

A. Section 033000 – Cast-in-place-concrete
B. Section 042000 – Unit Masonry
C. Section 076000 – Sheet Metal Work.

1.3 REFERENCES

A. ASTM International (ASTM):
   1. ASTM C 510 - Standard Test Method for Staining and Color Change of Single or Multi-component Joint Sealants.
   2. ASTM C 719 - Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants under Cyclic Movement (Hockman Cycle).
   3. ASTM C 794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.
   4. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants.
   5. ASTM C 1087 - Standard Test Method for Determining Compatibility of Liquid- Applied Sealants with Accessories Used in Structural Glazing Systems.
   6. ASTM C 1193 - Standard Guide for Use of Joint Sealants.
   7. ASTM C 1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants.
   8. ASTM D 412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic ElastomersTension.
   9. ASTM D 679 - Methods of Testing and Tolerances for Certain Fine Staple Cotton Gray Goods.
   10. ASTM D 816 - Standard Test Methods for Rubber Cements.
   11. ASTM D 1002 - Standard Test Method for Apparent Shear Strength of Single-Lap-Joint Adhesively Bonded Metal Specimens by Tension Loading (Metal-to-Metal).
   12. ASTM D 2203 - Standard Test Method for Staining from Sealants.
   13. ASTM D 2240 - Standard Test Method for Rubber Property Durometer Hardness

1.4 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Test Reports:

1. Submit results of laboratory pre-construction testing.
2. Submit results of field pre-construction testing.
3. Submit manufacturer's recommendations for joint preparation, priming, and joint accessory materials based on test results.
4. Submit manufacturer's recommended installation procedure modifications resulting from field adhesion tests.

D. Shop Drawings: Submit details to show installation and interface between sealants and adjacent work.

E. Selection Samples: For each finish product specified, two complete sets of color charts for each sealant type for initial selection.

F. Verification Samples: For each finish product specified, two samples, standard cured color samples for each sealant type illustrating selected colors.

G. Manufacturer's Certificate:

1. Certify products are suitable for intended use and products meet or exceed specified requirements.
2. Certify applicator is approved by manufacturer.

H. Qualifications Data:

1. Submit applicator's qualifications, including reference projects of similar scope and complexity, with current phone numbers and contact names of architects and owners for verification.

I. Manufacturer's Field Reports:

1. Indicate time present at project site.
2. Include observations; indicate compliance with manufacturer's installation instructions, and supplemental instructions provided to installers.

J. Operation and Maintenance Data:

1. Submit recommended inspection intervals.
2. Submit instructions for repairing and replacing failed sealant joints.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum 10 year experience manufacturing similar products.

B. Applicator Qualifications:

1. Company specializing in performing work of this section with minimum three years documented experience, minimum three successfully completed projects of similar scope and complexity, and approved by manufacturer.
2. Designate one individual as project foreman who shall be on site at all times during installation.

C. Laboratory Pre-Construction Testing:

1. Test sealants, joint accessories, and joint substrates in accordance with the following, before starting work of this section:
   a. Obtain samples of joint substrate products specified in other sections.
   b. Adhesion: ASTM C 794 and ASTM C 719; determine surface preparation and required primer.
   c. Compatibility: ASTM C 1087; determine materials forming joints and adjacent materials do not adversely affect sealant materials and do not affect sealant color.
   d. Staining: ASTM D 2203, ASTM C 510, or ASTM C 1248; determine sealants will not stain joint substrates.
2. Pre-construction testing is not required when sealant manufacturer can furnish data acceptable to Architect based on previous testing for materials matching those of the Work.

D. Field Pre-Construction Testing:

1. Test each elastomeric sealant and joint substrate in accordance with the following, before beginning work of this section:
   a. Install sealants in field samples and mockups using joint preparation methods determined by laboratory pre-construction testing.
   b. Remove existing sealant, clean joint, and install new sealant using manufacturer's recommended joint preparation methods.
   c. Install field-test joints in inconspicuous location as approved by Architect.
   d. Test Method: Manufacturer's standard field adhesion test to verify joint preparation and primer required to obtain optimum adhesion of sealants to joint substrate.
   e. When test indicates sealant adhesion failure, modify joint preparation, primer, or both and retest until joint passes sealant adhesion test.

E. Mockup:

1. Install sealants in mockups specified in other sections including sealant and joint accessories to illustrate installation quality and color.
2. Incorporate accepted mockup as part of Work.
3. Repair seal joint mockups used for field adhesion testing.

1.6 PRE-INSTALLATION MEETINGS

A. Convene minimum two weeks prior to starting work of this section.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.

B. Store primers and sealants in cool dry location with ambient temperature range of 60 to 80 degrees F (15 to 27 degrees C).

C. Handling: Handle materials to avoid damage.

1.8 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

B. Optimal application temperature is 32 degree F (0 degree C) and rising.

1. Maintain sealant at room temperature before applying. If temperatures are below 32 degrees F (0 degrees C) contact manufacturer's customer service for application guidelines.

1.9 SEQUENCING

A. Schedule work so waterproofing, water repellents and preservative finishes are installed after sealants, unless sealant manufacturer approves otherwise in writing.

B. Ensure sealants are cured before covering with other materials.

C. Ensure that Work of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.10 WARRANTY

A. Provide manufacturer's signed standard limited warranty, against adhesive and cohesive failure of sealant and against infiltration of water and air through sealed joint for period of 1 year from date of completion.

1. Manufacturer's standard warranty covering sealant materials.

2. PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Chem Link, which is located at: 353 E. Lyons St.; Schoolcraft, MI 49087 ; Toll Free Tel: 800-826-1681; Tel: 269-679-4440 ; Fax: 269-679-4448 ; Email:request info (`); Web:www.chemlink.com

B. Substitutions: Equal Products by BASF, Sherwin-Williams, Dow-Corning, Sika, Pecora, Tremco

C. Requests for substitutions will be considered in accordance with provisions of Section 01600 - Product Requirements.

2.2 POLYETHER SEALANTS

A. Type: 100% solids one-component, gun grade, polyether-base material. The sealant shall cure under the influence of atmospheric moisture to form an elastomeric joint material.

1. Regulatory Compliance:

a. Conforms to OTC Rule for Sealants

b. Meets requirements of California Regs: CARB, BAAQMD and SCAQMD

c. Product does not contain cancer causing chemicals listed in California Proposition 65.

B. Product: M-1 Structural Adhesive/Sealant as manufactured by Chem Link.

1. ASTM C 920, Type S, Grade NS, Class 35, Use T1, NT, M, A, G and O.

2. Federal Specification TT-C-0230C, Type II, Class B.

3. CAN/CGSB-19.13-M87, Classification MCG-2-25-A-N, No. 81026.
4. Conforms to USDA requirements for Non-food Contact.
5. VOC Content: Less than 20 grams / liter ASTM D2369 EPA Method 24 (tested at 240 degree F / 115 degree C).
6. Performance Requirements:
    a. Tensile Properties (ASTM D-412) at 21 days: Tensile Stress: 370-psi minimum. Elongation at Break: 525%.
    b. Shear Strength (ASTM D-1002): 390 psi.
    c. Shore A Hardness (ASTM D-2240) at 21 days: 45.
    d. Adhesion in Peel (TT-S-00230C, ASTM C 794).
    e. Service Range: -40 degree to 200 degree F (-40 degree to 93 degree C).
    f. The sealant shall conform The sealant shall be non-staining.
    g. Optimal application temperature 32 degree F (0 degree C) and rising. Maintain sealant at room temperature before applying. If temperatures are below 32 degrees F (0 degrees C) contact manufacturer's customer service for application guidelines.

C. Product: DuraLink 35 Siding - Window - Door - Roof Sealant as manufactured by Chem Link.
1. ASTM C 920, Type S, Grade NS, Class 35, Use T2, NT, M, A, G and O.
2. Federal Specification TT-C-0230C, Type II, Class B.
3. VOC Content: Less than 24 grams / liter ASTM D2369 EPA Method 24 (tested at 240 degree F / 115 degree C).
4. Performance Requirements:
    a. Initial Cure (ASTM D-679): 45 minutes
    b. Properties (ASTM D-412) at 21 days: Tensile Stress - 230-psi minimum. Elongation at Break - 420%.
    c. Shore A Hardness (ASTM D-2240) at 21 days: 31.
    d. Service Range: -40 degree to 200 degree F (-40 degree to 93 degree C).
    e. The sealant shall be non-staining.
    f. Optimal application temperature 32 degree F (0 degree C) and rising. Maintain sealant at room temperature before applying. If temperatures are below 32 degrees F (0 degrees C) contact manufacturer's customer service for application guidelines.

D. Product: NovaLink SL Self-Leveling Construction Sealant as manufactured by Chem Link.
1. ASTM C 920, Type S, Grade P, Class 25, Use T2, NT, M.
2. CAN/CGSB-19.13-M87, Classification C-1-40-B-N and C-1-25-B-N, No. 81028.
3. Conforms to USDA requirements for Non-food Contact.
4. VOC Content: Less than 24 grams / liter ASTM D2369 EPA Method 24 (tested at 240 degree F / 115 degree C).
5. Performance Requirements:
    a. Initial Cure (ASTM D-679): 120 minutes
    b. Properties (ASTM D-412) at 21 days: Tensile Strength at break: minimum 120 psi. Elongation at Break - Minimum 350%.
    c. Shore A Hardness (ASTM D-2240) at 21 days: 15 +/- 3.

d. Adhesion in Peel (ASTM C-794).

e. Service Range: -40 degree to 200 degree F (-40 degree to 93 degree C).

f. The sealant shall be non-staining. Final Cure: 7 to 10 days.

g. Optimal application temperature 32 degree F (0 degree C) and rising. Maintain sealant at room temperature before applying. If temperatures are below 32 degrees F (0 degrees C) contact manufacturer's customer service for application guidelines.

E. Product: Clear General Purpose Sealant as manufactured by Chem Link.

1. ASTM C920, Type S, Grade NS, Class 25; Uses NT, T2, M, G, A and O.
2. Federal Specification TT-S-00230-C Type II, Class B.
3. Corps of Engineers CRD-C-541, Type II, Class B.
4. Canadian Standards Board CAN 19, 13-M82.
5. Conforms to USDA Requirements for Non-food Contact.
6. VOC Content: Less than 14 grams / liter ASTM D2369 EPA Method 24 (tested at 240 degree F / 115 degree C).
7. Performance Requirements:
   a. Initial Cure/Tack Free (ASTM D-679): 20 +/- 10 minutes.
   b. Shrinkage: No visible shrinkage after 14 days.
   c. Low Temperature Flex (ASTM D-816): Pass -10 degree F (-23 degree C) 1/4 inch (6.4 mm) mandrel.
   d. Shear Strength (ASTM D-1002): 200 psi.
   e. Properties (ASTM D-412) at 21 days: Tensile Strength: 230 psi. Elongation at Break - Minimum 400%.
   f. Shore A Hardness (ASTM D-2240) at 21 days: 14 +/- 2.
   g. Service Range: -40 degree to 200 degree F (-40 degree to 93 degree C).
   h. Optimal application temperature 32 degree F (0 degree C) and rising. Maintain sealant at room temperature before applying. If temperatures are below 32 degrees F (0 degrees C) contact manufacturer's customer service for application guidelines.

2.3 SILICONE SEALANTS

A. Type: Single component neutral cure (RTV) silicone, adhesive sealant.

1. Regulatory Compliance:
   a. Conforms to OTC Rule for Sealants
   b. Meets requirements of California Regs: CARB, BAAQMD and SCAQMD
   c. Product does not contain cancer causing chemicals listed in California Proposition 65.

B. Product: DuraSil Neutral Cure High Performance Adhesive/Sealant as manufactured by Chem Link.

1. ASTM C920, Type S, Grade NS, Class 50; Uses NT, T2, M, G, A and O.
2. Federal Specification TT-S-00230-C Type II, Class A
3. Corps of Engineers CRD-C-541, Type II, Class A
4. Canadian Standards Board CAN 19, 13-M82.
5. Conforms to USDA Requirements for Non-food Contact.

6. VOC Content: Less than 33 grams / liter ASTM D2369 EPA Method 24 (tested at 240 degree F / 115 degree C).
7. Performance Requirements:
   a. Initial Cure/Tack Free (ASTM D-679): 10 +/- 5 minutes.
   b. Shrinkage: No visible shrinkage after 14 days.
   c. Low Temperature Flex (ASTM D-816): Pass -10 degree F (-23 degree C) 1/4 inch (6.4 mm) mandrel.
   d. Shear Strength (ASTM D-1002): 75 +/-5 psi.
   e. Properties (ASTM D-412) at 21 days: Tensile Strength: 135 psi. Elongation at Break - Minimum 600%.
   f. Shore A Hardness (ASTM D-2240) at 21 days: 10 +/- 3.
   g. Service Range: -80 degree to 400 degree F (-62 degree to204 degree C).
   h. Optimal application temperature 32 degree F (0 degree C) and rising. Maintain sealant at room temperature before applying. If temperatures are below 32 degrees F (0 degrees C) contact manufacturer's customer service for application guidelines.

C. Product: MetaLink Neutral Cure Metal Roof Sealant as manufactured by Chem Link.
1. ASTM C920, Type S, Grade NS, Class 50; Uses NT, T2, M, G, A and O.
2. Federal Specification TT-S-00230-C Type II, Class A
3. Corps of Engineers CRD-C-541, Type II, Class A
4. Canadian Standards Board CAN 19, 13-M82.
5. Conforms to USDA Requirements for Non-food Contact.
6. VOC Content: Less than 33 grams / liter ASTM D2369 EPA Method 24 (tested at 240 degree F / 115 degree C).
7. Performance Requirements:
   a. Initial Cure/Tack Free (ASTM D-679): 10 +/- 5 minutes.
   b. Shrinkage: No visible shrinkage after 14 days.
   c. Low Temperature Flex (ASTM D-816): Pass -10 degree F) 1/4 inch (6.4 mm) mandrel.
   d. Shear Strength (ASTM D-1002): 75 +/-5 psi.
   e. Properties (ASTM D-412) at 21 days: Tensile Strength: 135 psi. Elongation at Break - Minimum 600%.
   f. Shore A Hardness (ASTM D-2240) at 21 days: 10 +/- 3.
   g. Service Range: -80 degree to 400 degree F (-62 degree to204 degree C).
   h. Optimal application temperature 32 degree F (0 degree C) and rising. Maintain sealant at room temperature before applying. If temperatures are below 32 degrees F (0 degrees C) contact manufacturer's customer service for application guidelines.

2.4 ACCESSORIES

A. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

B. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

C. Joint Backing: Round foam rod compatible with sealant; oversized 25 to 50 percent larger than joint width; recommended by sealant manufacturer to suit application

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

E. Masking tape: Non-staining, non-absorbent tape product compatible with joint sealants and adjacent joint surfaces.

3. EXECUTION

3.1 EXAMINATION

A. Verify substrate surfaces and joint openings are ready to receive work.
   1. Verify joint surfaces are clean and dry.
   2. Ensure concrete surfaces are fully cured.

B. Report unsatisfactory conditions in writing to the Architect;

C. Do not proceed until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Prepare joints in accordance with ASTM C 1193 and manufacturer's instructions.

B. Clean joint surfaces to remove dirt, dust, oils, wax, paints, and other contamination capable of affecting primer and sealant bond.
   1. Clean concrete joint surfaces to remove curing agents and form release agents.

C. Protect elements surrounding the Work of this section from damage or disfiguration. Apply masking tape to adjacent surfaces when required to prevent damage to finishes from sealant installation.

3.3 EXISTING WORK

A. Mechanically remove existing sealant.

B. Clean joint surfaces of residual sealant and other contaminates capable of affecting sealant bond to joint surface.

C. Allow joint surfaces to dry before installing new sealants.

3.4 SEALANT INSTALLATION

A. Install primer and sealants in accordance with ASTM C 1193 and manufacturer's instructions.

B. Install joint backing to maintain the following joint ratios:
   1. Joints up to 1/2 inch (13 mm) Wide: 1:1 width to depth ratio.
   2. Joints Greater than 1/2 inch (13 mm) Wide: 2:1 width to depth ratio; maximum 1/2 inch joint depth.

C. Install bond breaker where joint backing is not used.

D. Apply primer where required for sealant adhesion.

E. Install sealants immediately after joint preparation.

F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

G. Tool exposed joint surface flat.

3.5 MANUFACTURER'S FIELD SERVICES

A. Require sealant manufacturer to be present at project site to:
   1. Observe sealant mockup installation and to issue reports of observations.

2. Conduct field pre-construction testing.

3.6 CLEANING

A. Remove masking tape. Clean adjacent surfaces soiled by sealant installation.

3.7 SCHEDULE - SEALANT JOINTS

A. Exterior Sealant Joint [Type A]:
   1. Applications: Control and expansion joints in cast-in-place concrete.
      a. Joints between architectural and structural precast concrete units.
      b. Control and expansion joints in unit masonry.
      c. Control and expansion joints in stone masonry.
      d. Butt joints between metal panels.
      e. Joints between different materials listed above.
      f. Perimeter joints between materials listed above and frames of doors, windows, storefronts, louvers and similar openings.
      g. Control and expansion joints in soffits and overhead surfaces.
      h. Other exterior joints in vertical surfaces and non-traffic horizontal surfaces for which no other sealant is specified.
   2. Single Component Polyether Sealants:
      a. DURALINK 35

B. Exterior Sealant Joint [Type B]:
   1. Applications:
      a. Metal roofs, gutters, downspouts, and other metal architectural surfaces.
   2. Single Component Silicone Sealants:
      a. METALINK

C. Interior Sealant Joint [Type C]:
   1. Applications:
      a. Control and expansion joints on exposed interior surfaces of exterior walls.
      b. Perimeter joints on exposed interior surfaces of exterior openings.
      c. Joints on precast beams and planks.
      d. Perimeter joints between interior wall surfaces and frames of interior doors, windows, storefronts, louvers, elevator entrances and similar openings.
      e. Other interior joints in vertical surfaces and non-traffic horizontal surfaces subject to movement for which no other sealant is specified.
   2. Single Component Polyether Sealants:
      a. M-1

D. Traffic Sealant Joint [Type D]:
   1. Excludes Highways & Parking Ramps
   2. Applications:
      a. Control, expansion and isolation joints in cast-in-place concrete.

b. Control, expansion and isolation joints in structural precast concrete units.

c. Joints between architectural precast concrete paving units.

d. Tile control and expansion joints.

e. Joints between different materials listed above.

f. Other interior and exterior traffic bearing joints in horizontal and sloped traffic surfaces

3. Single Component Polyether Sealants:

a. NOVALINK SL

E. Interior Indirect Food Contact Sealant Joint [Type E]:

1. Applications:

a. Joints between food service surrounding construction.

b. Other interior joints, where incidental food contact may

2. Single Component Silicone Sealants:

a. DURASIL

F. Concealed Bedding Sealant Joint [Type F]:

1. Applications:

a. Bedding joints under metal thresholds and saddles.

b. Bedding joints between sheet metal flashing and other materials.

2. Single Component Silicone Sealants:

a. DURASIL

END OF SECTION

DIVISION 08 - OPENINGS
SECTION 081100 - HOLLOW METAL DOORS & FRAMES

1. SCOPE

1.1 Furnish all labor, material and equipment to completely install all steel doors, hollow metal door frames, hollow metal side lights and transoms and hollow metal glass settings as shown on the drawings or called for herein. **(All exterior doors and frames to be hot dipped galvanized and factory primed for painting)**

2. MATERIAL

2.1 Frames

A. Frames to be equal to frames as manufactured by Ceco Corporation or equal. Equal products by Republic, Curries, Mesker accepted.

B. All door frames shall be as detailed on the drawings, and shall be 16 gauge cold rolled steel with all angles, mold and returns and miters neatly welded and ground smooth.

C. At hinge and lock locations, reinforcement plates are to be spot welded to inner surface of jambs over which 26 gauge galvanized plaster guards are to be spot welded to protect tapped holes in reinforcing plates from mortar.

D. All necessary holes shall be drilled and tapped with templates furnished by hardware manufacturer to receive hinges, lock strikes, and other hardware specified.

E. All frames shall be anchored to concrete block walls with a minimum of three clip anchors for each jamb.

F. All frames shall have one shop coat of standard primer before shipment and shall be clearly marked to indicate door locations, etc.

G. Frames shall be fully protected during shipment and storage from rusting and denting and shall have channel struts at bottom of frame to hold frame at proper location until set.

H. Frames shall be anchored to concrete floor' by means of clip angles on each jamb which shall be bolted or fastened to the floor or by other approved method.

I. All hollow metal frames shall be furnished complete with three Glynn-Johnson GH-64 rubber door silencers, located on lock side of jamb and installed at the factory.

2.2 Doors

A. All steel doors shall be hollow metal welded doors equal to Ceco 1 3/4" Imperial doors of sizes and types shown on the drawings and shall be constructed of 16 gauge rolled leveled steel sheets and 12 gauge top and bottom channels.

B. All steel doors shall have a urethane filled core.

C. All doors shall be machined to fit hardware as per templates furnished by the Hardware Contractor.

D. All exterior doors shall be undercut 3/8" in lieu of 3/4".

E. Undercut all doors with thresholds 3/8" to meet ADA requirements.

F. The metal doors shall be factory primed and protected at all times to prevent rusting before final paint is applied.

G. All Doors to have seamless edges – LF Series – Epoxy Filled and Finished.

3. FINAL

3.1 This contractor shall furnish electronic copies of complete shop drawings of all metal frames and doors to the Architect for approval before fabrication.

3.2 This contractor shall also check the plans for all quantities, door swings, and any other details required before preparing the shop drawings.

END OF SECTION

DIVISION 08 - OPENINGS
SECTION 081117 – PRE-FINISHED STEEL DOOR FRAMES

1. GENERAL

1.1 Work Included

A. The work under this section shall include the furnishing of all items shown on the drawings and as specified, including but not limited to, the following:
   1. Knocked down, site assembled prefinished steel door frames
   2. Knocked down, site assembled sidelight, borrowed light, transom, and fullbound access door frames
   3. Pocket trim jambs and casings (Pocket frame and hardware not included)

1.2 Related Sections

A. Section 01 30 00 – Coordination, Site meetings
B. Section 01 60 00 - Product Requirements
C. Section 08 11 13 – Hollow Metal Doors and Frames
D. Section 08 12 16 – Aluminum frames
E. Section 08 14 00 - Wood Doors
F. Section 08 71 00 - Hardware
G. Section 08 80 00 - Glazing

1.3 References

A. ASTM A653 – Standard for hot dipped galvanized steel material
B. UBC 7-2-97, UBC 7-4-97 Positive Pressure Fire Test Certification
C. UL 10B Fire test of Door Assemblies and UL10C Standard for Positive Pressure Fire Tests of Door Assemblies
D. NFPA 80 - Fire Doors and Windows (Latest Edition)
E. NFPA-101 - Life Safety Codes (Latest Edition)
F. ASTM D2197 - Standard Test Method for Adhesion of Organic Coatings by Scrape Adhesion.
G. ASTM D2247 - Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.
H. ASTM D2794 - Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
I. ASTM D3361 - Standard Practice for Unfiltered Open-Flame Carbon-Arc exposures of Paint and Related Coatings.
J. ASTM B117 – Standard test for salt spray testing

1.4 Submittals

A. Section 01 33 00: Submittal procedures.
B. Product Data: Indicate frame material, Gauge, configuration and finishes.
C. Shop Drawings: See section 08 06 00. Indicate frame elevations, details of frame anchorage, reinforcements required, rough opening requirements, location of hardware embosses, and finishes. Detail each floor of the building separately.
D. Samples: Submit [_____] standard frame samples, illustrating factory finished frame colors.
E. Manufacturer's Installation Instructions: Provide installation instructions for all products under this section.
F. Manufacturer's Certificate of Warranty: (See Section 01 78 36) Provide manufacturer's standard warranty certificate stating material is warranted for a period of one year from date of building occupancy.

1.5 Quality Assurance
- A. Quality Standards
  1. Material free from defects in material and according to project specifications for pre-engineered opening systems.
  2. Proven durability of factory finishes allowing for bending and shaping of material after finish is applied.
- B. Fire Rated Frame Construction
  1. Conform to ASTM E152, NFPA 252, UL 10B and 10C.
- C. Installed Frame Assembly: Conform to NFPA 80
  1. Use only installers familiar with installation of prefinished opening systems and applied casing frame installation.

1.6 Delivery, Storage and Handling
- A. Section 01 60 00: Transport, handle, store, and protect products in a dry area off the ground.
- B. Accept frames on site in manufacturer's box packaging with identification labels intact. Inspect for damage.
- C. Do not open individual boxes until installation is to begin.

2. PRODUCTS

2.1 Acceptable Manufacturers
- A. Timely Industries, A Division of SDS Industries, Inc., 10241 Norris Avenue, Pacoima, CA, 91331-2292; Phone toll free: 800-247-6242; Fax: 818-492-3530. Web site: www.timelyframes.com.
- B. Equal products by RediFrame acceptable.
- C. Substitutions: Refer to Section 01 60 00

2.2 Frames
- A. Frame Material: Hot dipped galvanized steel, for interior frames in normal atmospheric exposures.
- B. Frame Material: Hot dipped galvanized steel for all frames used in the following locations:
  1. Exterior Locations
  2. Public and Private Restrooms
  3. Coastal locations for both interior and exterior applications exposed to salt air or salt spray within 10 miles of any ocean or salt water lake.
- C. Frame Throat Opening: As shown on plan details to suit finished wall thickness.
- D. Fire rated frames and Office Entry frames to be CK series with kerf formed into frame profile with factory installed, pre-mitered smoke/sound control gasket.
- E. Frame Profile - Unequal Rabbet profile, standard with manufacturer
  1. "S" Series, 0.9 mm (20 Gauge) thick, interior office spaces.
  2. "C" Series, 1.2 mm (18 Gauge) thick, other areas, non standard jamb depths.
  3. "CK" Series, 1.2 mm (18 Gauge) thick, with kerf for door seal/gasket .
  4. "E" Series 0.9 mm (20 Gauge) thick
     a. #430 Bright Polished Stainless Steel
     b. #304 Brushed Stainless Steel
     c. Polished Brass, Brass Base metal (Cannot be fire rated)
     d. Polished Brass, Steel Base metal (Can be fire rated)
  5. "P" Series, 1.2 mm (18 Gauge) thick, trim frames for pocket doors
- F. Side Light Frames: 1.2 mm (18 Gauge) Verify glass dimensions for fire rated sidelights and borrowed lights.
- G. Casings
  1. Provide steel or aluminum casings formed to be applied to heat treated clips on frame face after frame is anchored to wall.

2.3 Frame Reinforcement and Accessories

A. Provide reinforcements shipped loose to project site for hardware application.
   1. TA-10 - Regular arm closers, casing mounted coordinators.
   2. TA-12 - Parallel arm closers, Rim Exit device strikes, other stop mounted surface hardware.
   3. TA-47 – For CK frame, Parallel arm closers, Rim Exit device strikes, other stop mounted surface hardware.
   4. TA-25 - Double acting spring hinges, continuous hinges, other surface mounted hardware on door rabbet or cased opening frame.
   5. Provide hinge reinforcement (TA-11) of 14 Gauge steel pierced to create depth of thread for hinge screws equal to or exceeding 7 Gauge steel.

B. Weatherstrip/Smoke Gasket: TA-46 (QDS500) 90 minute rated gasket for kerfed frames. All pieces factory mitered to assure perfect corner alignment. Select color: Browntone, Black, Western White, Off White, Grey, Beige (custom colors not available).

C. Silencers: TA-5 vinyl, 2 per frame, clear stick-on type. Silencers not required on Kerfed frames or frames scheduled to receive stop mounted gasket or weatherstrip.

D. Glass Stops: TA-14 removable rolled steel, shape, butted ends. Pre-punch and countersink for flat head tek screws.

E. Adjustable strikes: Emboss frames for TA-1 strike for cylindrical lock. Provide TA-1 strike in finish compatible with hardware finish. (ANSI 2 ¾" T strike supplied with cylindrical lock cannot be used with standard frame because of unique strike location and screw piercing method).

F. Prepare frames for ASA 4-7/8" strikes where required. Provide minimum ¼" depth of threads in factory tapped screw holes.

G. Installation fasteners (Provided by others)
   1. Interior Frames: #6 Drywall type length sufficient to penetrate studs or structure at least ½".
   2. Exterior Frames: Drywall type, corrosion resistant coating, same as G.1 above.

2.4 Fabrication

A. Openings for single swing, pair, borrowed light and sidelight frames to be pre-cut, notched and fabricated at the manufacturer's facility. For fire rated and exterior openings, provide kerf at stop for installation of smoke gasket or weatherstrip.

B. Provide minimum 14 Gauge hinge reinforcement plate tapped for machine screws supplied with hinges. Hinge plate to be mechanically attached to hinge emboss on frame.

C. Casing Clips: Fabricate frames with factory applied, heat treated clips to ensure no deflection in the clip upon application or removal of casing. Attachment clips may not be of same material as frame.

D. Provide notches, tabs and/or stops for positive alignment of frame parts at all corners.

E. Mullions to be notched as required to provide tight joints.

F. Provide manufacturer's standard mullion brackets for positive connection of frame and mullion parts

G. Provide manufacturer's standard steel glass stop pre-cut to exact length. Fire rated glazed openings to have hole for installation screw within 2" of each end of stop piece.

H. Provide insert channel full width of borrowed lights installed on finish floor. Provide full width head channel for ceiling height units.

I. Provide adequate structural support (by others) for ceiling insert channel for ceiling height frames

J. Transom bars to be fixed type with compatible profiles to jamb and head.

K. Attach approved mylar label to each fire-rated frame indicating fire rating details.

L. Factory install TA-46 smoke gasket on all prefinished, CK series frames. Install with factory mitered corners to ensure adequate seal and pleasing appearance.

2.5 Finishing

A. Frame Units: Prefinished with factory applied impact resistant, polyurethane baked enamel finish or optional electrostatic applied water based paint system.

B. Frames for high humidity areas to be hot dipped galvanized. See 2.02.B for specific locations.

C. Casing Finishes
   1. Steel: Prefinished with factory applied impact resistant, polyurethane baked enamel finish.
   2. Aluminum: Prefinished with factory applied impact resistant, polyurethane baked enamel finish or Clear anodized for Alumatone (SC108) paint finished frames.

D. Colors: (Select)
   1. Designer Colors: Select from manufacturer's standard pre-matched custom colors.

3. EXECUTION

3.1 Examination

A. Verify acceptability of existing conditions before starting work.

B. Verify that opening sizes and wall thicknesses are within specified tolerances. Verify that all finished walls are in plane to ensure proper door alignment.

3.2 Installation

A. Install frames in accordance with manufacturer's requirements.

B. Anchor frames with screws located at every casing clip or every 11" as shown on manufacturer's instructions. Field verify quantity and location of fasteners prior to installing casing.

C. Install prefinished frames near end of the project after wall painting and wall coverings are applied.

D. Install frames using qualified installers familiar with installation of prefinished drywall frames.

E. Coordinate installation of glass and glazing in glazed units.

F. Coordinate installation of frames with installation of hardware specified in Section 08 71 00 and doors in Section 08 21 00.

G. Touch-up blemishes on finished frames with factory prepared touch up paint.

END OF SECTION

DIVISION 08 - OPENINGS
SECTION 081400 - WOOD DOORS

1. SCOPE

1.1 This Contractor shall furnish all labor, material and equipment for the complete installation of all wood doors shown and details on the drawings and as specified herein.

2. GENERAL

2.1 Related Sections
- A. Section 062200 – Millwork
- B. Section 081100 - Metal Frames
- C. Section 087100 - Finish Hardware
- D. Section 088100 - Glass and Glazing

2.2 References and Regulatory Requirements
- A. ASTM E152-81a - Standard Methods of Fire Tests of Door Assemblies
- B. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies 1995 Edition.
- C. UL l0B - Fire Tests of Door Assemblies, 9th Edition.
- D. NFPA 80 - Fire Doors and Windows.
- E. Quality Standards:
  1. NWWDA Industry Standard I.S. 1-A-97 (National Wood Window and Door Association).
  2. AWI Quality Standards 7th Edition, Version 1.0 1997.
  3. ANSI A115. W Series, Wood Door Hardware Standards (American National Standard Institute).
- F. Labeling Agencies
  1. Underwriters Laboratories, Inc. (UL)
  2. Warnock Hersey

2.3 Provide manufacturer's warranty for interior solid core doors for full life of original installation including re-hanging and refinishing.

2.4 Provide certificate of compliance that all doors comply with the specifications.

2.5 All doors shall be stored and installed as recommended by the manufacturer.

3. MATERIALS

3.1 Interior Doors Non-Rated
- A. Doors shall be as scheduled flush, solid core, plain sliced oak faces with matching edges. Doors shall be equal to Marshfiled DPC-1 5-Ply particle board core door, 1-3/4" (44MM).

3.2 Interior Doors Rated
- A. Doors shall be as scheduled flush, solid core, plain sliced oak faces with matching edges. Doors shall be equal to Marshfield, DFP-20 (20 minute), 5 ply particle board core door, 1-3/4" (44 MM), rated by UL, DFM-45 (45 minute), DFM-60 (60 minute), DFM-90 (90 minute) mineral core doors, 1- 3/4" (44 MM) rated by UL.

3.3 All doors shall be stained and finished at the factory in color(s) as selected by the Architect. Match Existing color and finish.

3.4 Stiles shall be hard wood to match face veneer. Veneer edge banding shall not be used.

3.5 All rated doors shall be factory pre-machined.

3.6 All rated doors shall bear Underwriters Laboratories or Warnock Hersey label and meet all labeling requirements.

3.7 Equal products by Oshkosh Door Co., Eggers Industries, VT Industires will be accepted.

3.8 Glazing Stops
- A. Non-rated overlapping ALL shaped wood of same species as door facing and mitered comers.
- B. Fire rated veneer wrapped rolled steel of same species as door facing or metal vision frames.

4. EXECUTION

4.1 Install all fire rated and non-rated doors as per manufacturer's requirements.
4.2
4.3 Submit electronic copies of shop drawings to the Architect for approval prior to ordering.

END OFSECTION

DIVISION 08 - OPENINGS
SECTION 084100 – ALUMINUM FRAMED ENTRANCES AND STOREFRONTS

1. SCOPE

1.1 Description

A. This Contractor shall furnish all necessary materials, labor and equipment for the complete installation of aluminum frame glass doors and windows, sidelights, frames and other aluminum work as shown on the drawings and as specified herein.

B. Kawneer listed as basis of design. Equal products by Boyd, Vistawall, Tubelite, EFCO and Manko will be accepted.

2. MATERIALS

2.1 Frames for Doors and Windows

A. Frames shall be equal to TRI-FAB 451T as manufactured by Kawneer aluminum entrances with tubular frames and sidelight 2" X 4-1/2" extruded aluminum at exterior applications

Interior applications shall have TRI-FAB 450 as manufactured by Kawneer aluminum entrances with tubular frames and sidelights 1-3/4" X 4-1/2" extruded aluminum.

B. All units shall be equipped with glazing stops, door stops and all accessories for complete installation of entrances and windows.

C. Finish over all material to be dark bronze anodized.

2.2 Doors

A. Aluminum entrance doors shall be equal to Kawneer 500 Wide Stile in anodized finish. Interior Doors to be 190 Series Narrow Stile.

B. Doors will be equipped with the following hardware:
1. See finish hardware – section 087100

C. Finish over all material to be dark bronze anodized.

2.3 Windows

A. Aluminum framing (see above) for windows to match existing profiles and finish. Provide operable sections and screens as indicated to match existing.

B. Windows to have sill extension as indicated on drawings.

C. Provide standard hardware in standard finish.

D. Finish over all material to be dark bronze anodized.

2.4 Fabrication

A. The door stile and the rail face dimensions of the doors shall be as shown on drawings.

B. Corner construction shall consist of mechanical clip fastening. SIGMA deep penetration and fillet welds. Glazing stops shall be hook-in type with EPDM glazing gaskets.

C. The door weathering on a single acting offset pivot or butt hung door arid frame (single or pairs) shall be Kawneer SEALAIR weathering, a thermoplastic elastomer weathering on a tubular shape with a semi-rigid polymeric backing.

D. The door weathering on a double acting, center pivoted door and frame (single or pairs) shall be pile cloth.

E. The meeting tiles on pairs of doors shall be equipped with an adjustable

3. INSTALLATION

3.1 All aluminum doors and frames shall be set in correct locations as shown on drawings and details and shall be level, square and plumb and in alignment with other work in accordance with the manufacturer's installation instructions and approved shop drawings. All joints between framing and the building structure shall be sealed in order to secure a watertight installation.

3.2 After installation, the General Contractor shall adequately protect exposed portions of aluminum surfaces from damage by grinding and polishing compounds, plaster, lime, acid, cement, or other contaminants. The General Contractor shall be responsible for final cleaning.

END OF SECTION

DIVISION 08 - OPENINGS
SECTION 085655 – SECURITY TRANSACTION WINDOWS

HOLE AND BACKER TRANSACTION WINDOW

1. GENERAL

1.1 REFERENCE

A. Underwriters Laboratory UL 752-Standard for Bullet Resisting Equipment & ASTM E119-98-Standard Test Methods for Fire Tests of Building Construction and Materials, NIJ Standard 0108.01-(National Institute of Justice) Standard for Ballistic Resistant Protective Materials, ASTM B 209/B 209M- Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate, ASTM A 666-Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar..

1.2 SUBMITTALS

A. The following shall be submitted by the manufacturer in accordance with Sections 13070 and any Special Contract Requirements and coordinate with Sections 01340: Submit for approval prior to fabrication: samples, product data (including preparation, storage and installation methods), cuts & anchor spacing, reinforcement & location , product specifications, shop drawings, test reports (current UL Listing Verification & UL 752 Test Results as provided by Underwriters Laboratories), and printed data in sufficient detail to indicate compliance with the contract documents.

B. Manufacturer's Instructions for installation and cleaning of TSS Bullet Transaction Window Assemblies. All required submittals shall be approved prior to installation.

1.3 DESIGN PERFORMANCE

A. Through the design, manufacturing techniques and material application the TSS Hole and Backer Transaction Window shall be of the "non-ricochet" type. This design is intended to permit the encapture and retention of an attacking projectile lessening the potential of a random injury or lateral penetration. This assembly shall provide single transaction positions utilizing the "Acrylic" backer configuration. This design shall employ an acrylic voice ports in transaction glazing to complete the "Hole and Backer" design. Each transaction position shall have a stainless steel dip tray as shown on the drawings. Components must be manufactured in strict accordance with the specifications, design and details. All vision panels shall be cut to size with all exposed edges polished. Necessary holes shall be pre drilled and tapped where required. Stainless Steel assembly screws and acrylic spacers shall be provided. Clear anodized angles and channels shall be provided. Anchor screws shall be provided by the installer.

B. No field alterations to the construction of the units fabricated under the acceptable standards shall be allowed unless approved by the manufacturer and the architect. Standard manufacturing tolerances shall be +/- 1/16".

C. Materials shall meet or exceed UL 752 requirements.

1.4 QUALITY ASSURANCE

A. Manufacturer shall be a Company that specializes in manufacturing products of the specified type with a minimum of five years' experience. Installer shall be a Company that specializes in product type specified and Certified for the installation by the manufacturer. Manufacturer shall provide a Mock-up, if required, for evaluation of surface preparation and application workmanship and color/finish to the Architect for approval prior to start of work.

1.5 DELIVERY, STORAGE & HANDLING

A. Handle the materials with care to prevent damage. Store materials inside and under cover, stack flat and off floor. Project conditions (temperature, humidity, and ventilation) shall be within the maximum limit recommendations set by manufacturer. Do not install products that are under conditions outside these limits.

1.6 WARRANTY

A. All materials shall be warranted against defects for a period of 1 year for the date of receipt at the project site. Certificates of manufacturer's standard limited warranty shall be provided at project completion.

2. PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Products shall be manufactured by: Total Security Solutions, Inc, 170 National Park Drive, Fowlerville, MI 48836, 800-513-1468. Attn: Sales Department, info@tssbulletproof.com. Web: www.tssbulletproof.com. No substitutions shall be accepted.

B. Equal products by other manufacturers will be accepted.

2.2 BULLET RESISTANT HOLE AND BACKER TRANSACTION WINDOW

A. Product shall be: TSS Hole and Backer Transaction Window: The Hole and Backer System consists of custom prefabricated bullet resistant panels with secure air passage as required for voice transmission. Aluminum frame, with a plastic laminate base and recessed cash tray. All accessories for installation are included. Available finishes include clear anodized or powder coated.

B. Glazing Panels shall be **UL Level 2** (specify options below) as shown on the drawings.

1) Bullet-Resisting Glazing Material Options:

Bullet Resistant Level 1

- 3/4" LP 750 Laminated
- 1 1/4" Uncoated Acrylic
- GCP 750

Bullet Resistant Level 2

- **1" LP 1000 Laminated**
- **1 3/8" UnCoated Acrylic**
- **TSS 002 L/S**

Bullet Resistant Level 3

- 1 1/4" LP 1250 Laminated
- TSS 003 L/S

Bullet Resistant Level 4, 5, & 8

- TSS 004 L/S, TSS 005 L/S & TSS 008 L/S

C. Cash tray: Brushed Stainless Steel Counter Mounted or Recessed

1) Cash tray to be 18 ga. stainless steel, # 4 finish 16" x 10" from the outside edge of flanges with a clear opening

D. Provide a shelf 1 1/2" thick with a recessed cash tray. The shelf to be full width of window, 18" deep, centered under the glazing and covered with a black high pressure laminate. (Optional stainless steel 18 ga. #4 finish).

E. (Recommend Frame Option: Aluminum) Aluminum sections to be manufactured in accordance with ASTM B209, Extruded aluminum alloy 6063 T5 Anodized or powder coated finish to match the existing décor and be free of sharp edges or burrs when in place. Glazing Channel: U-Channel specifically designed for securing transparencies tightly in place. Angles and stops are only acceptable for top attachment.

1) Frame to be anodized aluminum (optional 18 ga. primed steel or 18 ga. stainless steel - specify). The bottom of the glazing to be capped with corresponding material on the frame (ie: stainless steel on stainless steel).

3. EXECUTION

3.1 PREPARATION

A. Prior to installing the bullet resistive material, the contractor shall verify that all supports have been installed as required by the contract documents and architectural drawings, and approved shop/CAD drawings, if required. Installer shall notify architect of any unsatisfactory preparation that is responsibility of another installer.

B. Clean and prepare all surfaces per manufacturers recommendations for achieving the best results for the substrate under the project conditions.

3.2 INSTALLATION

A. Do not begin installation until openings have been verified and surfaces properly prepared in accordance with Drawings. Install in accordance with manufacturer's instructions and UL 752. Set all equipment plumb. All products shall be installed per installation instructions provided by Total Security Solutions, if warranty is to be issued.

B. TSS Hole and Backer Transaction Window: shall arrive on site as a completed unit. Unit shall be installed in provided opening (wall/door), secured to structure (anchors by others).

3.3 POST APPLICATION

A. TSS Hole and Backer Transaction Window: shall be installed in accordance with manufacturer's printed recommendations, including adhering to anchoring and finishing details.

B. Inspection and Cleaning: Verify installation is complete and complies with manufacturer's requirements. Clean product and accessories, removing excess sealant, labels and protective covers.

C. Touch-up, repair or replace damaged products before Substantial Completion.

D. Product Warranty: Applicable warranty shall be issued to owner upon final release of completed project.

END OFSECTION

DIVISION 08 - OPENINGS
SECTION 087100 - FINISH HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Mechanical and electrified door hardware for:

    a. Swinging doors.

2. Electronic access control system components
3. Field verification, preparation and modification of existing doors and frames to receive new door hardware.

B. Section excludes:

1. Windows
2. Cabinets (casework), including locks in cabinets
3. Signage
4. Toilet accessories
5. Overhead doors

C. Related Sections:

1. Division 01 Section "Alternates" for alternates affecting this section.
2. Division 06 Section "Rough Carpentry"
3. Division 06 Section "Finish Carpentry"
4. Division 07 Section "Joint Sealants" for sealant requirements applicable to threshold installation specified in this section.
5. Division 08 Sections:

    a. "Metal Doors and Frames"
    b. "Flush Wood Doors"
    c. "Stile and Rail Wood Doors"
    d. "Interior Aluminum Doors and Frames"
    e. "Aluminum-Framed Entrances and Storefronts"
    f. "Stainless Steel Doors and Frames"
    g. "Special Function Doors"
    h. "Entrances"

6. Division 09 sections for touchup, finishing or refinishing of existing openings modified by this section.
7. Division 26 "Electrical" sections for connections to electrical power system and for low-voltage wiring.
8. Division 28 "Electronic Safety and Security" sections for coordination with other components of electronic access control system and fire alarm system.

1.02 REFERENCES

A. UL - Underwriters Laboratories

1. UL 10B - Fire Test of Door Assemblies
2. UL 10C - Positive Pressure Test of Fire Door Assemblies
3. UL 1784 - Air Leakage Tests of Door Assemblies
4. UL 305 - Panic Hardware

B. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule
2. Recommended Locations for Builders Hardware
3. Keying Systems and Nomenclature
4. Installation Guide for Doors and Hardware

C. NFPA – National Fire Protection Association

1. NFPA 70 – National Electric Code
2. NFPA 80 – 2016 Edition – Standard for Fire Doors and Other Opening Protectives
3. NFPA 101 – Life Safety Code
4. NFPA 105 – Smoke and Draft Control Door Assemblies
5. NFPA 252 – Fire Tests of Door Assemblies

D. ANSI - American National Standards Institute

1. ANSI A117.1 – 2017 Edition – Accessible and Usable Buildings and Facilities
2. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
3. ANSI/BHMA A156.28 - Recommended Practices for Keying Systems
4. ANSI/WDMA I.S. 1A - Interior Architectural Wood Flush Doors
5. ANSI/SDI A250.8 - Standard Steel Doors and Frames

1.03 SUBMITTALS

A. General:

1. Submit in accordance with Conditions of Contract and Division 01 Submittal Procedures.
2. Prior to forwarding submittal:

    a. Comply with procedures for verifying existing door and frame compatibility for new hardware, as specified in PART 3, "EXAMINATION" article, herein.
    b. Review drawings and Sections from related trades to verify compatibility with specified hardware.
    c. Highlight, encircle, or otherwise specifically identify on submittals: deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.

B. Action Submittals:

1. Product Data: Submit technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:

    a. Wiring Diagrams: For power, signal, and control wiring and including:
        1) Details of interface of electrified door hardware and building safety and security systems.
        2) Schematic diagram of systems that interface with electrified door hardware.
        3) Point-to-point wiring.
        4) Risers.

3. Samples for Verification: If requested by Architect, submit production sample of requested door hardware unit in finish indicated and tagged with full description for coordination with schedule.

    a. Samples will be returned to supplier. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.

4. Door Hardware Schedule:

    a. Submit concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work critical in Project construction schedule.
    b. Submit under direct supervision of a Door Hardware Institute (DHI) certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule published by DHI.
    c. Indicate complete designations of each item required for each opening, include:
        1) Door Index: door number, heading number, and Architect's hardware set number.
        2) Quantity, type, style, function, size, and finish of each hardware item.
        3) Name and manufacturer of each item.
        4) Fastenings and other pertinent information.
        5) Location of each hardware set cross-referenced to indications on Drawings.
        6) Explanation of all abbreviations, symbols, and codes contained in schedule.
        7) Mounting locations for hardware.
        8) Door and frame sizes and materials.
        9) Degree of door swing and handing.
        10) Operational Description of openings with electrified hardware covering egress, ingress (access), and fire/smoke alarm connections.

5. Key Schedule:

    a. After Keying Conference, provide keying schedule that includes levels of keying, explanations of key system's function, key symbols used, and door numbers controlled.

b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion. Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
f. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.

6. Templates: After final approval of hardware schedule, provide templates for doors, frames and other work specified to be factory or shop prepared for door hardware installation.

C. Informational Submittals:

1. Provide Qualification Data for Supplier, Installer and Architectural Hardware Consultant.
2. Provide Product Data:

a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
b. Include warranties for specified door hardware.

D. Closeout Submittals:

1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:

a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
b. Catalog pages for each product.
c. Factory order acknowledgement numbers (for warranty and service)
d. Name, address, and phone number of local representative for each manufacturer.
e. Parts list for each product.
f. Final approved hardware schedule edited to reflect conditions as installed.
g. Final keying schedule
h. Copies of floor plans with keying nomenclature
i. Copy of warranties including appropriate reference numbers for manufacturers to identify project.
j. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.

E. Inspection and Testing:

1. Submit a written report of the results of functional testing and inspection for fire door assemblies, in compliance with NFPA 80.

a. Written report to be provided to the Owner and be made available to the Authority Having Jurisdiction (AHJ).

b. Report to include the door number for each fire door assembly, door location, door and frame material, fire rating, and summary of deficiencies.

2. Submit a written report of the results of functional testing and inspection for required egress door assemblies, in compliance with NFPA 101.

   a. Written report to be provided to the Owner and be made available to the Authority Having Jurisdiction (AHJ).
   b. Report to include the door number for each required egress door assembly, door location, door and frame material, fire rating, and summary of deficiencies.

1.04 QUALITY ASSURANCE

A. Qualifications and Responsibilities:

1. Supplier: Recognized architectural hardware supplier with record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that provides certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.

   a. Warehousing Facilities: In Project's vicinity.
   b. Scheduling Responsibility: Preparation of door hardware and keying schedules.
   c. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies like those indicated for this Project.
   d. Coordination Responsibility: Assist in coordinating installation of electronic security hardware with Architect and electrical engineers and provide installation and technical data to Architect and other related subcontractors.
      1) Upon completion of electronic security hardware installation, inspect and verify that all components are working properly.

2. Installer: Qualified tradesperson skilled in the application of commercial grade hardware with experience installing door hardware similar in quantity, type, and quality as indicated for this Project.
3. Architectural Hardware Consultant: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:

   a. For door hardware: DHI certified AHC or DHC.
   b. Can provide installation and technical data to Architect and other related subcontractors.
   c. Can inspect and verify components are in working order upon completion of installation.
   d. Capable of producing wiring diagram and coordinating installation of electrified hardware with Architect and electrical engineers.

4. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

B. Certifications:

1. Fire-Rated Door Openings:

    a. Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction.
    b. Provide only items of door hardware that are listed products tested by Underwriters Laboratories, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.

2. Smoke and Draft Control Door Assemblies:

    a. Provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105
    b. Comply with the maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.

3. Electrified Door Hardware

    a. Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.

4. Accessibility Requirements:

    a. Comply with governing accessibility regulations cited in "REFERENCES" article 087100, 1.02.D3 herein for door hardware on doors in an accessible route. This project must comply with all Federal Americans with Disability Act regulations and all Local Accessibility Regulations.

C. Pre-Installation Meetings

1. Keying Conference

    a. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
        1) Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
        2) Preliminary key system schematic diagram.
        3) Requirements for key control system.
        4) Requirements for access control.
        5) Address for delivery of keys.

2. Pre-installation Conference

    a. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
    b. Inspect and discuss preparatory work performed by other trades.
    c. Inspect and discuss electrical roughing-in for electrified door hardware.
    d. Review sequence of operation for each type of electrified door hardware.
    e. Review required testing, inspecting, and certifying procedures.

f. Review questions or concerns related to proper installation and adjustment of door hardware.

3. Electrified Hardware Coordination Conference:

a. Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly replace products damaged during shipping.

B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package. Deliver each article of hardware in manufacturer's original packaging.

C. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.

D. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.

E. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.

F. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

1.06 COORDINATION

A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.

B. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

E. Existing Openings: Where existing doors, frames and/or hardware are to remain, field verify existing functions, conditions and preparations and coordinate to suit opening conditions and to provide proper door operation.

1.07 WARRANTY

A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within published warranty period.

1. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.
2. Warranty Period: Beginning from date of Substantial Completion, for durations indicated in manufacturer's published listings.

a. Mechanical Warranty
1) Locks
a) Schlage ND Series: 10 year
2) Exit Devices
a) Von Duprin: 3 year
3) Closers
a) LCN 4050 Series: 25 year
b) LCN 1450 Series: 25 year
4) Accessories
a) Ives Continuous Hinges: Lifetime

b. Electrical Warranty
1) Locks
a) Schlage: 1 year
2) Exit Devices
a) Von Duprin: 1 year
3) Closers
a) LCN: 2 year

1.08 MAINTENANCE

A. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

B. Turn over unused materials to Owner for maintenance purposes.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. The Owner requires use of certain products for their unique characteristics and project suitability to ensure continuity of existing and future performance and maintenance standards. After investigating available product offerings, the Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: "No Substitute."

1. Where "No Substitute" is noted, submittals and substitution requests for other products will not be considered.

B. Approval of manufacturers and/or products other than those listed as "Scheduled Manufacturer" or "Acceptable Manufacturers" in the individual article for the product category shall be in accordance with QUALITY ASSURANCE article, herein.

C. Approval of products from manufacturers indicated in "Acceptable Manufacturers" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.

D. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

2.02 MATERIALS

A. Fasteners

1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
2. Furnish screws for installation with each hardware item. Finish exposed (exposed under any condition) screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
3. Provide concealed fasteners for hardware units exposed when door is closed except when no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless thru-bolts are required to fasten hardware securely. Review door specification and advise Architect if thru bolts are required.
4. Install hardware with fasteners provided by hardware manufacturer.

B. Modification and Preparation of Existing Doors: Where existing door hardware is indicated to be removed and reinstalled.

1. Provide necessary fillers, Dutchmen, reinforcements, and fasteners, compatible with existing materials, as required for mounting new opening hardware and to cover existing door and frame preparations.
2. Use materials which match materials of adjacent modified areas.
3. When modifying existing fire-rated openings, provide materials permitted by NFPA 80 as required to maintain fire-rating.

C. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.

1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

D. Cable and Connectors: Hardwired Electronic Access Control Lockset and Exit Device Trim:

1. Data: 24AWG, 4 conductor shielded, Belden 9843, 9841 or comparable.
2. DC Power: 18 AWG, 2 conductor, Belden 8760 or comparable.
3. Provide type of data and DC power cabling required by access control device manufacturer for this installation.

4. Where scheduled in the hardware sets, provide each item of electrified hardware and wire harnesses with enough and wire gauge with standardized Molex plug connectors to accommodate electric function of specified hardware. Provide Molex connectors that plug directly into connectors from harnesses, electric locking and power transfer devices. Provide through-door wire harness for each electrified locking device installed in a door and wire harness for each electrified hinge, electrified continuous hinge, electrified pivot, and electric power transfer for connection to power supplies.

2.03 HINGES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

   a. Ives 5BB series

2. Acceptable Manufacturers and Products:

   a. Stanley FBB series
   b. Bommer BB5000 series

B. Requirements:

1. Provide hinges conforming to ANSI/BHMA A156.1.
2. Provide five knuckle, ball bearing hinges.
3. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:

   a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
   b. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high

4. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:

   a. Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high
   b. Interior: Heavy weight, steel, 5 inches (127 mm) high

5. 2 inches or thicker doors:

   a. Exterior: Heavy weight, bronze or stainless steel, 5 inches (127 mm) high
   b. Interior: Heavy weight, steel, 5 inches (127 mm) high

6. Adjust hinge width for door, frame, and wall conditions to allow proper degree of opening.
7. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
8. Where new hinges are specified for existing doors or existing frames, provide new hinges of identical size to hinge preparation present in existing door or existing frame.
9. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:

   a. Steel Hinges: Steel pins
   b. Non-Ferrous Hinges: Stainless steel pins
   c. Out-Swinging Exterior Doors: Non-removable pins
   d. Out-Swinging Interior Lockable Doors: Non-removable pins

e. Interior Non-lockable Doors: Non-rising pins

10. Provide hinges with electrified options as scheduled in the hardware sets. Provide with enough and wire gage to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component. Provide mortar guard for each electrified hinge specified.

2.04 ELECTRIC POWER TRANSFER

A. Manufacturers:

1. Scheduled Manufacturer and Product:

a. Von Duprin EPT-10

2. Acceptable Manufacturers and Products:

a. No Substitute

B. Requirements:

1. Provide power transfer with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
2. Locate electric power transfer per manufacturer's template and UL requirements, unless interference with operation of door or other hardware items.

2.05 CYLINDRICAL LOCKS – GRADE 1

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

a. Schlage ND series

2. Acceptable Manufacturers and Products:

a. No Substitute

B. Requirements:

1. Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 1, and UL Listed for 3-hour fire doors.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2-inch latch throw. Provide proper latch throw for UL listing at pairs.
4. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
5. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
7. Provide electrified options as scheduled in the hardware sets.

8. Lever Trim: Solid cast levers without plastic inserts and wrought roses on both sides.

    a. Lever Design: Rhodes

2.06 ELECTRONIC ACCESS CONTROL WIRELESS CYLINDRICAL LOCK

A. Manufacturers:

1. Scheduled Manufacturer and Product:

    a. Schlage NDEB series (Provided by Division 28)

2. Acceptable Manufacturers and Products:

    a. No substitute

B. Requirements:

1. ANSI/BHMA A156.2 Series 4000, Grade 1.
2. Florida Building Code (ASTM E330, E1886, E1996) and Miami Dade (TAS 201, 202, 203) requirements for hurricanes.
3. Certified to UL10C 3-hour rating, ULC-S319, FCC Part15, ADA RoHS, ICC ANSI A117.1
4. Listed, UL 294 - The Standard of Safety for Access Control System Units.
5. Compliant with ANSI/BHMA A156.25 Operation and Security interior operating range of 32 degrees F (0 degrees C) to 120 degrees F(49 degrees C) for interior use only.
6. Compliant with ASTM E330 for door assemblies.
7. Compliant with ICC / ANSI A117.1, NFPA 101, NFPA 80 and IBC Chapter 10 Cylinders: Refer to "KEYING" article, herein.
8. Provide cylindrical locksets exceeding the ANSI/BHMA A156.2 Grade 1 performance standards for strength, security, and durability in the categories below:

    a. Abusive Locked Lever Torque Test – minimum 3,100 inch-pounds without gaining access
    b. Offset lever pull – minimum 1,600-foot pounds without gaining access
    c. Vertical lever impact – minimum 100 impacts without gaining access
    d. Cycle Test - tested to minimum 16 million cycles with no visible lever sag or use of performance aids such as set screws or spacers.

9. Emergency Override: Provide mechanical key override; cylinders: Refer to "KEYING" article, herein.
10. Levers:

    a. Vandal Resistance: Exterior (secure side) lever rotates freely while door remains locked, preventing damage to internal locking components from vandalism by excessive force.
    b. Provide lever trim that operates independently of each other and is field reversible without tools.
    c. Style: Rhodes

11. Power Supply: 4 AA batteries

a. Provide battery powered wireless electronic products with the ability to communicate battery status and battery voltage level by means of a mobile app at door and remotely by Partner integrated software.

12. Features:

a. Ability to communicate unit's communication status.
b. Visual LED indicators that indicate activation, operational systems status, system error conditions and low power conditions.
c. Audible feedback that can be enabled or disabled.
d. Suitable for both interior and exterior deployment.
e. Employ Wi-Fi communications to permit remote view of audits and alerts, as well as provide automatic daily updates to lock configuration and user access rights.

13. Adaptability:

a. Open Architecture: Provide locksets manufactured with open architecture characteristics capable of handling new and existing access control software and credential reading technology. Can be supported by cloud-based web and mobile apps without the need for an integrated software partner.

14. Switches:

a. Door Position Sensor – magnet integrated into strike to eliminate additional door prep
b. Interior Cover Tamper Guard
c. Battery Status
d. Request to Exit
e. Interior Push Button

15. Credentials: Provide integral credential reader modules in the following configurations:

a. NFC, including peer-peer compatible, operable with both Android and IOS mobile devices
b. 125 kHz contactless smart cards
    1) Compatibility: Schlage, XceedID, ISONAS, HID, GE/CASI, AWID

c. 13.56 MHz contactless smart cards
    1) Secure section (multi-technology and smart card) compatibility: Schlage MIFARE Classic, Schlage MIFARE DESFire EV1
    2) 13.56 MHz Serial number only (multi-technology and smart card) compatibility: DESFire CSN, HID iCLASS CSN, MIFARE CSN, MIFARE DESFire EV1 CSN

d. Multi-technology contactless for applications requiring read capability for both 125 kHz proximity and 13.56 MHz contactless smart cards.
e. BLE

16. Records: Subject to the limitations of the attached access control system, the wireless locks possess enough storage capacity to support 5000 users and 2000 audits.
17. Verification time: less than or equal to 1 second for smart cards and proximity cards

2.07 OFFLINE CONTROLLER

A. Manufacturer and Product:

1. Scheduled Manufacturer and Product:

   a. Schlage CTE Engage Controller (By Division 28)

2. Acceptable Manufacturers and Products:

   a. No Substitute

B. Requirements:

1. Provide an offline single opening controller UL 294 listed and compatible with the Schlage Engage Application. Include a multi-technology reader kit.
2. Provide offline controller with the following power options:

   a. Power Over Ethernet (POE)
      1) .5A at 12 VDC for up to 500 feet.
      2) 1.5A at 24 VDC for up to 500 feet.

   b. 12 VDC in 2A at 12 VDC for up to 500 feet.
   c. 24 VDC in 2A at 24 VDC for up to 500 feet.

3. Provide offline controller with the following communication standards:

   a. Bluetooth low energy version 4.2.
   b. 2.4 GHz Wi-Fi (IEEE 802.11b/g/n).
   c. WPA2, WPA, WEP, 802.1x (PEAP).
   d. Transport Layer Security (TLS) version 12.
   e. Advanced Encryption Standard (AES) 256-bit.

4. Provide offline controller with the following signal inputs:

   a. One Schlage MT11-485 or MT15-485 reader.
   b. Request to Enter (REN).
   c. Request to Exit (REX).
   d. Remote Release – hardwired.
   e. Door Position Switch (DPS).
   f. Reader tamper (TAMP).

5. Provide offline controller with the following signal outputs:

   a. Card Reader 0.3A at 12 VDC for up to 500 feet.
   b. Locking mechanism: 2A at 30 VDC max.
   c. Auxiliary: 2A at 30 VDC max.
   d. Alarm: 2A at 30 VDC max.

6. Provide offline controller with the following with operating temperatures between -31 F (-35 C) to 151 F (66 C).
7. Provide offline controller with the following on board database:

   a. up to 5,000 users

b. up to 2,000 audits (FIFO)
c. up to 16 Time Zones
d. up to 32 Holiday Schedules
e. up to 16 Schedules (lock & unlock)

8. Provide offline controller with the following connectivity options:

a. Apple or Droid smart phone – Bluetooth updates to CTE.
b. Wi-Fi access point – automatic daily updates (one time per day) if connected to Wi-Fi.

C. Provide offline controller with "No-Tour" with MT20W enrollment reader and Schlage 1K smart credentials (13.56 MHz).

2.08 ELECTRIC STRIKES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

a. Von Duprin 6000 Series.

2. Acceptable Manufacturers and Products:

a. Folger Adam 300 Series
b. HES 1006 Series

B. Requirements:

1. Provide electric strikes designed for use with type of locks shown at each opening.
2. Provide electric strikes UL Listed as burglary resistant.
3. Where required, provide electric strikes UL Listed for fire doors and frames.
4. Provide transformers and rectifiers for each strike as required. Verify voltage with electrical contractor.

2.09 POWER SUPPLIES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

a. Schlage/Von Duprin PS900 Series

2. Acceptable Manufacturers and Products:

a. Precision ELR series
b. Security Door Controls 600 series

B. Requirements:

1. Provide power supplies approved by manufacturer of supplied electrified hardware.

2. Provide appropriate quantity of power supplies necessary for proper operation of electrified locking components as recommended by manufacturer of electrified locking components with consideration for each electrified component using power supply, location of power supply, and approved wiring diagrams. Locate power supplies as directed by Architect.
3. Provide regulated and filtered 24 VDC power supply, and UL class 2 listed.
4. Provide power supplies with the following features:

    a. 12/24 VDC Output, field selectable.
    b. Class 2 Rated power limited output.
    c. Universal 120-240 VAC input.
    d. Low voltage DC, regulated and filtered.
    e. Polarized connector for distribution boards.
    f. Fused primary input.
    g. AC input and DC output monitoring circuit w/LED indicators.
    h. Cover mounted AC Input indication.
    i. Tested and certified to meet UL294.
    j. NEMA 1 enclosure.
    k. Hinged cover w/lock down screws.
    l. High voltage protective cover.

2.10 CYLINDERS

A. Manufacturers:

1. Scheduled Manufacturer and Product:

    a. **Schlage (Match Existing Key System)**

2. **Acceptable Manufacturers and Products:**

    a. No Substitute

B. Requirements:

1. Provide **permanent** cylinders/cores to match Owner's existing key system, compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset, manufacturer's series as indicated. Refer to "KEYING" article, herein.

2.11 KEYING

A. Provide a factory registered keying system, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.

B. Provide cylinders/cores keyed into Owner's existing keying system managed by Owner's locksmith, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.

C. Requirements:

1. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.

    a. Master Keying system as directed by the Owner.

2. Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.
3. Provide keys with the following features:

    a. Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
    b. Patent Protection: Keys and blanks protected by one or more utility patent(s).

4. Identification:

    a. Mark permanent cylinders/cores and keys with applicable blind code for identification. Do not provide blind code marks with actual key cuts.
    b. Identification stamping provisions must be approved by the Architect and Owner.
    c. Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
    d. Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to Owner.
    e. Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.

5. Quantity: Furnish in the following quantities.

    a. Change (Day) Keys: 3 per cylinder/core.
    b. Master Keys: 6.

2.12 KEY CONTROL SYSTEM

A. Manufacturers:

1. Scheduled Manufacturer:

    a. Telkee

2. Acceptable Manufacturers:

    a. No Substitute
    b. HPC
    c. Lund

B. Requirements:

1. Provide key control system, including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150% of number of locks required for Project.

a. Provide complete cross index system set up by hardware supplier, and place keys on markers and hooks in cabinet as determined by final key schedule.
b. Provide hinged-panel type cabinet for wall mounting.

2.13 DOOR CLOSERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

a. LCN 4050A series

2. Acceptable Manufacturers and Products:

a. Falcon SC70A series
b. Norton 7500 series

B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with cast aluminum cylinder.
3. Closer Body: 1-1/2-inch (38 mm) diameter with 11/16-inch (17 mm) diameter heat-treated pinion journal and full complement bearings.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and all weather requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and back check.
7. Pressure Relief Valve (PRV) Technology: Not permitted.
8. Provide stick on templates, special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.14 DOOR CLOSERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

a. LCN 1450 series

2. Acceptable Manufacturers and Products:

a. Falcon SC80A series
b. Norton 8000 series

B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory.
2. Provide door closers with fully hydraulic, full rack and pinion action with cast aluminum cylinder.
3. Closer Body: 1-3/8-inch (35 mm) diameter with 5/8-inch (16 mm) diameter pinion journal diameter heat-treated pinion journal and full complement bearings.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Pressure Relief Valve (PRV) Technology: Not permitted.
7. Provide stick on and special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.15 DOOR TRIM

A. Manufacturers:

1. Scheduled Manufacturer:

a. Ives.

2. Acceptable Manufacturers:

a. Burns
b. Rockwood

B. Requirements:

1. Provide push plates, push bars, pull plates, and pulls with diameter and length as scheduled.

2.16 PROTECTION PLATES

A. Manufacturers:

1. Scheduled Manufacturer:

a. Ives

2. Acceptable Manufacturers:

a. Trimco
b. Rockwood

B. Requirements:

1. Provide protection plates with a minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.

2. Sizes plates 2 inches (51 mm) less width of door on single doors, pairs of doors with a mullion, and doors with edge guards. Size plates 1 inch (25 mm) less width of door on pairs without a mullion or edge guards.
3. At fire rated doors, provide protection plates over 16 inches high with UL label.

2.17 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

A. Manufacturers:

1. Scheduled Manufacturers:

   a. Glynn-Johnson

2. Acceptable Manufacturers:

   a.
   b. Rixson
   c. ABH

B. Requirements:

1. Provide overhead stop at any door where conditions do not allow for a wall stop or floor stop presents tripping hazard.
2. Provide friction type at doors without closer and positive type at doors with closer.

2.18 DOOR STOPS AND HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer:

   a. Ives

2. Acceptable Manufacturers:

   a. Burns
   b. Rockwood

B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide concave type where lockset has a push button of thumbturn.
2. Where a wall stop cannot be used, provide universal floor stops.
3. Where wall or floor stop cannot be used, provide overhead stop.
4. Provide roller bumper where doors open into each other and overhead stop cannot be used.

2.19 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:

1. Scheduled Manufacturer:

   a. Zero International

2. Acceptable Manufacturers:

   a. National Guard
   b. Reese

B. Requirements:

1. Provide thresholds, weather-stripping, and gasketing systems as specified and per architectural details. Match finish of other items.
2. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.
4. Size thresholds 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width unless otherwise specified in the hardware sets or detailed in the drawings.

2.20 SILENCERS

A. Manufacturers:

1. Scheduled Manufacturer:

   a. Ives

2. Acceptable Manufacturers:

   a. Burns
   b. Hiawatha

B. Requirements:

1. Provide "push-in" type silencers for hollow metal or wood frames.
2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified.

2.21 DOOR POSITION SWITCHES

A. Manufacturers:

1. Scheduled Manufacturer:

a. Schlage

2. Acceptable Manufacturers:

a. No Substitute

B. Requirements:

1. Provide recessed or surface mounted type door position switches as specified.
2. Coordinate door and frame preparations with door and frame suppliers. If switches are being used with magnetic locking device, provide minimum of 4 inches (102 mm) between switch and magnetic locking device.

2.22 FINISHES

A. Finish: BHMA 626/652 (US26D); except:

1. Hinges at Exterior Doors: BHMA 630 (US32D)
2. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
3. Protection Plates: BHMA 630 (US32D)
4. Overhead Stops and Holders: BHMA 630 (US32D)
5. Door Closers: Powder Coat to Match
6. Wall Stops: BHMA 630 (US32D)
7. Latch Protectors: BHMA 630 (US32D)
8. Weatherstripping: Clear Anodized Aluminum
9. Thresholds: Mill Finish Aluminum

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance. Verify doors, frames, and walls have been properly reinforced for hardware installation.

B. Field verify existing doors and frames receiving new hardware and existing conditions receiving new openings. Verify that new hardware is compatible with existing door and frame preparation and existing conditions.

C. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

D. Submit a list of deficiencies in writing and proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Where on-site modification of doors and frames is required:

1. Carefully remove existing door hardware and components being reused. Clean, protect, tag, and store in accordance with storage and handling requirements specified herein.
2. Field modify and prepare existing doors and frames for new hardware being installed.
3. When modifications are exposed to view, use concealed fasteners, when possible.
4. Prepare hardware locations and reinstall in accordance with installation requirements for new door hardware and with:

   a. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
   b. Wood Doors: DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."
   c. Doors in rated assemblies: NFPA 80 for restrictions on on-site door hardware preparation.

3.03 INSTALLATION

A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
2. Custom Steel Doors and Frames: HMMA 831.
3. Interior Architectural Wood Flush Doors: ANSI/WDMA I.S. 1A
4. Installation Guide for Doors and Hardware: DHI TDH-007-20

B. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.

C. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.

D. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

E. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

F. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.

G. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated.

H. Wiring: Coordinate with Division 26, ELECTRICAL and Division 28 ELECTRONIC SAFETY AND SECURITY sections for:

1. Conduit, junction boxes and wire pulls.
2. Connections to and from power supplies to electrified hardware.

3. Connections to fire/smoke alarm system and smoke evacuation system.
4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
5. Connections to panel interface modules, controllers, and gateways.
6. Testing and labeling wires with Architect's opening number.

I. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

J. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.

K. Closer/Holders: Mount closer/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.

L. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.

M. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

N. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.

O. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

P. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

Q. Door Bottoms and Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

3.04 FIELD QUALITY CONTROL

A. Inspection and Testing:

1. Provide functional testing and inspection of fire door assemblies by a qualified person in accordance with NFPA 80.

    a. Schedule fire door assembly inspection within 90 days of Substantial Completion of the Project.
    b. Submit a signed, written final report as specified in Paragraph 1.03.E.1.
    c. Correct all deficiencies and schedule a reinspection of fire door assemblies noted as deficient on the inspection report.
    d. Inspector to reinspect fire door assemblies after repairs are made.

2. Provide inspection of required egress door assemblies by a qualified person in accordance with NFPA 101.

a. Schedule egress door assembly inspection within 90 days of Substantial Completion of the Project for the required openings.
b. Submit a signed, written final report as specified in Paragraph 1.03.E.2.
c. Correct all deficiencies and schedule a reinspection of egress door assemblies noted as deficient on the inspection report.
d. Inspector to reinspect required egress door assemblies after repairs are made.

3.05 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Spring Hinges: Adjust to achieve positive latching when door can close freely from an open position of 30 degrees.
2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
3. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

3.06 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items per manufacturer's instructions to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.07 DOOR HARDWARE SCHEDULE

A. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.

B. Discrepancies, conflicting hardware, and missing items are to be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application.

C. Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.

D. Hardware Sets:

Hardware Group No. 1
For use on Door #(s):
137A
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP		630	IVE
1	EA	WIRELESS ELECTRONIC LOCK	NDE80P6D RHO (BY OWNER)	✓	626	SCE
1	EA	SURFACE CLOSER	4050A SCUSH		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	RAIN DRIP	142AA		AA	ZER
1	EA	GASKETING	429A		AA	ZER
1	EA	DOOR SWEEP	8197AA		AA	ZER
1	EA	THRESHOLD	655A		A	ZER

Hardware Group No. 2
For use on Door #(s):
125A 125B
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	FIRE EXIT HARDWARE	99-L-F-06		626	VON
1	EA	RIM CYLINDER	20-022		626	SCH
1	EA	ELECTRIC STRIKE	6111 FSE 12/24 VAC/VDC	✓	613	VON
1	EA	SURFACE CLOSER	1450 CUSH		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV (AT 125B ONLY)		626	IVE
1	EA	GASKETING	188S @ RATED OPENINGS		BK	ZER
1	EA	POWER SUPPLY	PS902 900-2RS 120/240 VAC	✓	LGR	SCE
1		CONTROLLER	BADGEPASS BP1501 POE (BY OWNER)			

Hardware Group No. 3
For use on Door #(s):
143 145
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PRIVACY W/COIN TURN	L9044 06A L583-363 L283-722		626	SCH
1	EA	SURFACE CLOSER	1450 RW/PA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		626	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 4
For use on Door #(s):
123
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PUSH PLATE	8200 6" X 16"		630	IVE
1	EA	PULL PLATE	8302 10" 6" X 16"		630	IVE
1	EA	SURFACE CLOSER	1450 CUSH		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 5
For use on Door #(s):
126A 126B
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	CLASSROOM LOCK	ND70PD RHO		626	SCH
1	EA	OH STOP	90S @ 126B		630	GLY
1	EA	OH STOP	90S J @ 126A		630	GLY
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 6
For use on Door #(s):
140
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	CLASSROOM LOCK	ND70PD RHO		626	SCH
1	EA	ELECTRIC STRIKE	6211 FSE 12/16/24/28 VAC/VDC	✓	630	VON
1	EA	OH STOP	90S @ 126B		630	GLY
1	EA	SURFACE CLOSER	1450 RW/PA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
3	EA	SILENCER	SR64		GRY	IVE
1	EA	POWER SUPPLY	PS902 900-2RS 120/240 VAC	✓	LGR	SCE

DOOR CONTROLLED BY ACCESS CONTROL SYSTEM.

Hardware Group No. 7
For use on Door #(s):
127
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	ND80PD RHO		626	SCH
1	EA	SURFACE CLOSER	1450 RW/PA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		626	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 8
For use on Door #(s):
134
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	ND80PD RHO		626	SCH
1	EA	SURFACE CLOSER	1450 CUSH		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 9
For use on Door #(s):
139
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	ONE WAY DEADBOLT	B661P6		626	SCH
1	EA	PULL PLATE	8303 10" 4" X 16"		630	IVE
1	EA	FLUSH PULL	950		626	IVE
1	EA	WALL STOP	WS406/407CCV		626	IVE

AHJ APPROVAL REQUIRED FOR LOCKING CONDITIONS.

NOTE: FLUSH PULL TO BE MOUNTED ON PUSH SIDE OF DOOR. PULL PLATE TO BE MOUNTED ON PULL SIDE OF DOOR.

Hardware Group No. 10
For use on Door #(s):
118 119 120
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50PD RHO		626	SCH
1	EA	OH STOP	90S J		630	GLY
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 11
For use on Door #(s):
200
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50PD RHO		626	SCH
1	EA	WALL STOP	WS406/407CCV		626	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 12
For use on Door #(s):
129A 129B 130 131 133 137B
138 141
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	WIRELESS ELECTRONIC LOCK	NDE80P6D RHO (BY OWNER)	✓	626	SCE
1	EA	SURFACE CLOSER	1450 RW/PA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		626	IVE
1	EA	GASKETING	188S @ RATED OPENINGS		BK	ZER
3	EA	SILENCER	SR64 @ NON-RATED OPENINGS		GRY	IVE

Hardware Group No. 13
For use on Door #(s):
132 142
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	WIRELESS ELECTRONIC LOCK	NDE80P6D RHO (BY OWNER)	✓	626	SCE
1	EA	OH STOP	90S		630	GLY
1	EA	SURFACE CLOSER	1450 RW/PA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	188S @ RATED OPENINGS		BK	ZER
3	EA	SILENCER	SR64 @ NON-RATED OPENINGS		GRY	IVE

Hardware Group No. 14
For use on Door #(s):
135
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	WIRELESS ELECTRONIC LOCK	NDE80P6D RHO (BY OWNER)		626	SCE
1	EA	SURFACE CLOSER	1450 CUSH		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	188S @ RATED OPENINGS		BK	ZER
3	EA	SILENCER	SR64 @ NON-RATED OPENINGS		GRY	IVE

Hardware Group No. 15
For use on Door #(s):
112A 114B 115
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	WIRELESS ELECTRONIC LOCK	NDE80P6D RHO (BY OWNER)		626	SCE

REMAINDER OF HARDWARE IS EXISTING AND TO REMAIN. PROVIDE NEW LCN 4040 SURFACE CLOSER FOR EACH DOOR.

Hardware Group No. 16
For use on Door #(s):
146
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	POWER TRANSFER	EPT10 CON		689	VON
1	EA	EU STOREROOM LOCK	ND80P6DEU RHO RX CON 12V/24V DC		626	SCH
1	EA	SURFACE CLOSER	1450 RW/PA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		626	IVE
3	EA	SILENCER	SR64		GRY	IVE
1	EA	WIRE HARNESS	CON X LENGTH REQ'D			SCH
1	EA	DUAL CREDENTIAL CARD READER	WORK OF DIVISION 28			
1	EA	DOOR CONTACT	679-05		BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS 120/240 VAC		LGR	SCE

Hardware Group No. 17
For use on Door #(s):
100A 100B 113 116
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	ELECTRIC STRIKE	6211(AL) FSE / 6300 FSE AS REQ'D		630	VON
1	EA	POWER SUPPLY	PS902 900-2RS 120/240 VAC		LGR	SCE
1		CONTROLLER	BADGEPASS BP1501 POE (BY OWNER)			

NOTE: REMAINDER OF HARDWARE IS EXISTING AND TO REMAIN, REPLACE AS NEEDED. PROVIDE ELECTRIC STRIKE TO WORK WITH EXISTING HARDWARE. PROVIDE PANIC HARDWARE FOR DOORS 100A, 100B, 113. DOORS ARE IN EGRESS PATH FROM ASSEMBLY OCCUPANCY. DOOR 116 HAS PANIC HARDWARE CURRENTLY.

Hardware Group No. 18
For use on Door #(s):
101A 101B 102 103A 103B 104A
104B 105 106A 106B 107 108
109 110 111 114A 122 124
201 202
Provide each SGL door(s) with the following:
QTY DESCRIPTION CATALOG NUMBER FINISH MFR
HARDWARE IS EXISTING AND TO REMAIN.

Hardware Group No. 19
For use on Door #(s):
125C
Provide each SGL door(s) with the following:
QTY DESCRIPTION CATALOG NUMBER FINISH MFR
HARDWARE BY DOOR MFR.

END OF SECTION

DIVISION 08 - OPENINGS
SECTION 088100 - GLASS & GLAZING

1. SCOPE

1.1 This Contractor shall furnish and install all glass of every description as indicated on the drawings and specified herein including window glass, skylight glass, plate glass, obscure glass, insulating glass, mirrors and any other glazing as required for completion of this section of the specification. Also see Drawings.

2. MATERIALS

2.1 All window glass, other than insulating, will be D.S.T. equal to Libbey-Owens or Pittsburg.

2.2 Plate glass shall be 1/4" polished plate.

2.3 Insulating glass shall be factory installed 1" thick made of two 1/8" D.S.T., spacer and sealed edges.

2.4 All wire glass shall be 1/4" Misco with pattern selected by Architect.

2.5 Safety plate shall be 1/4" equal to Herculite as manufactured by Pittsburg or approved equal.

2.6 Glazing for Storefront Wall System, Entrances, etc.

A. Tinted insulating glass units, 1 inch consisting of two lights of 1/4 inch thick clear glass and an air space, double seal edge construction; with outboard light to receive tinted unit with full range of tint selection. Both heat strengthened. Acceptable manufacturers and products include PPG Industries, Inc., Solarban T window 560-14, (2) Crystal; and Cardinal Glass 55-114 (14% silver-second surface).

B. Clear tempered insulating glass units, 1 inch consisting of two lights of 1/4 inch thick clear tempered glass and an air space, double seal edge construction. Acceptable manufacturer's and products include the following: PPG Industries, Inc., Clear T window Cardinal Glass, Clear Insulated.

2.7 Mirrors shall be mirror quality plate glass copper protected, guaranteed for five years against silver spoilage and shall have all edges framed in polished stainless steel channels with four piece square corners equal to Miami-Carey, size to be 24" wide x 36," at locations were shown or detail on plans.

END OF SECTION

DIVISION 08 - OPENINGS

SECTION 088300 - MIRRORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes the following types of silvered flat glass mirrors:
   1. Annealed monolithic glass mirrors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.
   1. Mirrors. Include description of materials and process used to produce each type of silvered flat glass mirror specified that indicates sources of glass, glass coating components, edge sealer, and quality-control provisions.

B. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachments to other work.

C. Samples: For each type of the following products:
   1. Mirrors: 12 inches square, including edge treatment on two adjoining edges.
   2. Mirror Clips: Full size.
   3. Mirror Trim: 12 inches long.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Certificates: For each type of mirror, from manufacturer.

C. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For mirrors to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

B. Source Limitations for Mirrors: Obtain mirrors from single source from single manufacturer.

C. Source Limitations for Mirror Accessories: Obtain mirror glazing accessories from single source.

D. Glazing Publications: Comply with the following published recommendations:
   1. GANA's "Glazing Manual" unless more stringent requirements are indicated. Refer to this publication for definitions of glass and glazing terms not otherwise defined in this Section or in referenced standards.
   2. GANA Mirror Division's "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect mirrors according to mirror manufacturer's written instructions and as needed to prevent damage to mirrors from moisture, condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with mirror manufacturer's written instructions for shipping, storing, and handling mirrors as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install mirrors until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which mirror manufacturer agrees to replace mirrors that deteriorate within specified warranty period. Deterioration of mirrors is defined as

defects developed from normal use that are not attributed to mirror breakage or to maintaining and cleaning mirrors contrary to manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SILVERED FLAT GLASS MIRRORS

A. Glass Mirrors, General: ASTM C 1503.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Arch Aluminum & Glass Co., Inc.
   b. Gardner Glass, Inc.
   c. Gilded Mirrors, Inc.
   d. Guardian Industries.
   e. Head West.
   f. Independent Mirror Industries, Inc.
   g. Lenoir Mirror Company.
   h. Stroupe Mirror Co., Inc.
   i. Sunshine Mirror; Westshore Glass Corp.
   j. Virginia Mirror Company, Inc.
   k. Walker Glass Co., Ltd.

B. Clear Glass: Mirror glazing Quality.

1. Nominal Thickness: 5.0 mm.
2. **Provide safety film on back of all mirrors.**

2.2 MISCELLANEOUS MATERIALS

A. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

B. Edge Sealer: Coating compatible with glass coating and approved by mirror manufacturer for use in protecting against silver deterioration at mirrored glass edges.

2.3 MIRROR HARDWARE

A. Top and Bottom Aluminum J-Channels: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover bottom and top edges of each mirror in a single piece.

1. Bottom Trim: J-channels formed with front leg and back leg not less than 3/8 and 7/8 inch in height, respectively, and a thickness of not less than 0.05 inch.
2. Top Trim: J-channels formed with front leg and back leg not less than 5/8 and 1 inch in height, respectively, and a thickness of not less than 0.062 inch.
3. Finish: Clear bright anodized.

B. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.

C. Anchors and Inserts: Provide devices as required for mirror hardware installation. Provide toothed or lead-shield expansion-bolt devices for drilled-in-place anchors. Provide galvanized anchors and inserts for applications on inside face of exterior walls and where indicated.

2.4 FABRICATION

A. Mirror Sizes: To suit Project conditions, cut mirrors to final sizes and shapes.

B. Cutouts: Fabricate cutouts for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrors.

C. Mirror Edge Treatment: Flat polished

1. Seal edges of mirrors with edge sealer after edge treatment to prevent chemical or atmospheric penetration of glass coating.

2. Require mirror manufacturer to perform edge treatment and sealing in factory immediately after cutting to final sizes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance of the Work.

B. Verify compatibility with and suitability of substrates, including compatibility of mirror mastic with existing finishes or primers.

C. Proceed with installation only after unsatisfactory conditions have been corrected and surfaces are dry.

3.2 PREPARATION

A. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating substrates with mastic manufacturer's special bond coating where applicable.

3.3 INSTALLATION

A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that prevents distorting reflected images.

B. Provide a minimum air space of 1/8 inch between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.

C. Wall-Mounted Mirrors: Install mirrors with mirror hardware. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.

1. Top and Bottom Aluminum J-Channels: Provide setting blocks 1/8 inch thick by 4 inches long at quarter points. To prevent trapping water, provide, between setting blocks, two slotted weeps not less than 1/4 inch wide by 3/8 inch long at bottom channel.

3.4 CLEANING AND PROTECTION

A. Protect mirrors from breakage and contaminating substances resulting from construction operations.

B. Do not permit edges of mirrors to be exposed to standing water.

C. Maintain environmental conditions that will prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.

D. Wash exposed surface of mirrors not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash mirrors as recommended in writing by mirror manufacturer.

END OF SECTION

DIVISION 09 - FINISHES
SECTION 092100 - GYPSUM DRYWALL

1. SCOPE

1.1 Furnish all material, equipment, accessories and labor necessary to complete the drywall installation indicated on the drawings and specified herein.

2. MATERIALS

2.1 Gypsum Boards 1/2" or 5/8" thick as called for on drawings, with tapered edges, equal to Gold Bond, U.S. Gypsum, Celotex or Dierks.

2.2 Fire-rated Gypsum Board shall be equal to 1/2" or 5/8" thick Fireshield with tapered edges equal to U.S. Gypsum, Celotex, Gold Bond or Dierks, as called for on drawings.

2.3 Abuse Resistant Board shall be installed in areas noted on plans as ABR-1 and shall be equal to US Gypsum Sheetrock Brand Abuse-Resistant Panels, in 1/2" or 5/8" thicknesses as called for on the drawings, with tapered edges, heavy natural-finish paper on the face side and strong liner paper on the back side.

2.4 Gypsum Drywall shall be installed on metal studs above the ceiling as shown on the drawings.

2.5 Tape shall be cross-fibered with chambered edges feathered thin, equal to USG Perf-A-Tape.

2.6 Joint Cement & Topping Cement shall be product manufactured or recommended by the board manufacturer.

3. INSTALLATION

3.1 To minimize end joints, use wallboard of maximum practical length. End joints shall be staggered. Joints on opposite sides of a partition shall be so arranged as to occur on different studs. On ceiling run long dimension of gypsum board perpendicular to ceiling joists.

3.2 Anchoring spacing shall be as specified by the board manufacturer.

3.3 Flat joints shall be reinforced with tape and cemented with joint cement. Finish with topping cement as recommended by gypsum board manufacturer to a smooth, concealed joint.

3.4 Anchoring devices shall be recessed slightly and covered flush with topping cement.

3.5 Corners shall be taped as follows:
- A. Inside comers shall be reinforced with tape folded to adjoining surfaces to form a straight, true angle.
- B. Outside comers shall have metal comer beads and shall be concealed by no less than two coats of cement.

3.6 No cracked or broken board shall be used. Boards with slightly marred surfaces or edges may be installed only if boards can be patched to a regular, smooth 6nish. Contactor shall receive approval from Consultant before installing imperfect board.

3.7 Boards shall be applied horizontally over doors and other openings and extended beyond jambs no less than one stud spacing.

3.8 After final mud coat has dried, sand lightly to produce a smooth finished surface. All exposed surfaces to have level 4 finish.

3.9 Should gypsum board be installed in the winter, adequate heat shall be maintained in the structures at all times. This subcontractor shall verify with the General Contractor as to who will pay the cost of heating, if required.

3.10 A temperature of 65 degrees F. shall be maintained during installation of board as well as during the taping and finishing.

4. CLEAN-UP

4.1 Upon completion of the work, all areas shall be left broom clean with debris removed. Stains, mud droppings, and other foreign matter shall be cleaned from floors, trim, walls and ceilings. Area shall be ready for painting.

END OF SECTION

DIVISION 09 - FINISHES

SECTION 092200 – METAL SUPPORT ASSEMBLIES – NON-STRUCTURAL

1. GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Metal stud interior partition framing.
   2. Metal interior wall furring.
   3. Suspended metal channel [soffit] [and] [ceiling] framing.

B. Related Sections:
   1. Division 01: Administrative, procedural, and temporary work requirements.

1.2 REFERENCES

A. ASTM International (ASTM):
   1. A591/A591M - Standard Specification for Steel Sheet, Electrolytic Zinc-Coated, for Light Coating Weight (Mass) Applications.
   2. A641 - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
   3. A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
   4. A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.
   5. C635 - Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings.
   6. C636 - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
   7. C645 - Standard Specification for Non-Load (Axial) Bearing Steel Studs, Runners (Track), and Rigid Furring Channels for Screw Application of Gypsum Board.
   8. C754 - Standard Practice for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Wall board, Backing Board, or Water-Resistant Backing Board.
   9. E90 - Standard Test Method for Airborne Sound Transmission Loss of Building Partitions.
   10. E413 - Standard Test Method for Classification for Rating Sound Insulation.
B. Gypsum Association (GA) GA-600 - Fire Resistance Design Manual.
C. Steel Stud Manufacturer's Association (SSMA)(www.ssma.com - Member Directory.
D. Underwriters Laboratories, Inc. (UL) - Fire Resistance Directory.

1.3 SUBMITTALS

A. Submittals for Review:
   1. Product Data: Illustrate framing types, gages, and locations.

1.4 QUALITY ASSURANCE

A. Manufacturer: Current member of SSMA.
B. Installer Qualifications: Minimum 5 years experience in work of this Section.
C. Fire Resistance Ratings:
   1. Construct assemblies to achieve fire resistance ratings indicated on Drawings, in accordance with applicable UL design number.

2. If requirements of assembly numbers referenced conflict with Contract Document requirements, conform to assembly requirements.

D. Acoustic Ratings: Construct assemblies to achieve acoustic ratings indicated on Drawings, tested to ASTM E90 and classified in accordance with ASTM E413.

E. Deflection Limits:
1. Limit deflection of partitions to following limits, based on 5 PSF uniform design load.
a. Partitions to receive tile: L/360.
b. Other partitions: L/180
c. If partition height exceeds stud manufacturer's limiting height for applicable loading and deflection, install bracing above ceiling, decrease stud spacing, or increase stud gage.
2. Limit deflection of ceilings to L/360.

2. PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:
1. Allsteel and Gypsum Products, Inc. (www.allsteelproducts.com)
2. Clark Deitrich
3. Consolidated Fabricators Corp. (www.confabbpd.com)
4. Craco Manufacturing., Inc. (www.cracometals.com)
5. Custom Stud, Inc. (www.customstud.com)
6. Design Shapes in Steel.
7. Frametek Steel Products. (www.frameteksteel.com)
8. Steel Construction Systems. (www.steelconsystems.com)
9. United Metal Products, Inc. (www.unitedmetalproducts.info)

B. Substitutions: Under provisions of Division 01.

2.2 MATERIALS

A. Steel: A653/A653M or ASTM A1003/1003M, Class [G40] [__] hot dip galvanized.

2.3 COMPONENTS

A. Provide components in accordance with ASTM C645.

B. Studs: Non-load bearing roll-formed steel, SSMA stud profile, C-shaped, punched for utility access.

C. Top and Bottom Tracks:
1. Same material and finish as studs, C-shaped.
2. Standard track: SSMA stud track profile, 1-1/2 inch legs.
3. Deep leg track: SSMA deep stud track profile, 2 inch legs.
4. Deflection track: Deep leg track with slotted screw holes; permit plus or minus 1/2 inch movement of overhead structure without damage to partition.

D. Suspended Ceiling Framing:
1. Runner channels: 1-1/2 inches deep, cold roll formed, channel shaped, 16 gage base steel thickness.
2. Furring channels: Hat shaped, 7/8 inch deep, 25 gage base steel thickness.

**** OR ****

E. Suspended Ceiling Framing:
1. ASTM C635; manufactured specifically for suspended gypsum board ceiling applications.

2. Tees: Double web design; 1-1/2 inches high with 1-3/8 inch wide knurled faces, with interlocking ends and punched holes for cross tees and hanger wires.
3. Material: Galvanized steel.

F. Suspended Soffit Framing:
1. Runner channels: 1-1/2 inches deep, cold roll formed, 16 gage base steel thickness.
2. Furring channels: 3/4 inch deep, cold roll formed, 16 gage base steel thickness.

G. Resilient Channels: 1/2 inch deep x 2-1/2 inches wide, 25 gage base steel thickness.

H. Wall Furring Channels: Hat shaped, 7/8 inch deep, Z-shaped, depth as indicated, minimum 25 gage base steel thickness.

I. Shaft Wall Framing: [____] by [____] or approved substitute, consisting of studs formed to receive gypsum liner panels and top and bottom tracks.

2.4 ACCESSORIES

A. Fasteners: 3/8 inch long pan head screws.

B. Wire: ASTM A 641, galvanized steel.
1. Hanger wire: 8 gage base steel thickness.
2. Tie wire: 18 gage base steel thickness, soft annealed.

C. Wall Furring Brackets: Galvanized steel, two piece adjustable type.

D. Furring Channel Clips: Galvanized steel.

3. EXECUTION

3.1 INSTALLATION OF PARTITION FRAMING

A. Install in accordance with ASTM C754 and manufacturer's instructions.

B. Attach top and bottom tracks at ends and 24 inches on center maximum.

C. Position studs vertically in tracks, spaced maximum 16 inches on center unless indicated otherwise.

D. Install deflection track at head of partitions extending to structure. Cut studs 1/2 inch shorter than required length and fit into top track. Fasten studs to top track in manner permitting track movement.

E. Locate studs maximum 2 inches from door frames and abutting construction.

F. Use heavier gage studs or double studs on both sides of openings in partitions.

G. Install horizontal track as header above openings in partitions. Install studs from header to top track.

H. Brace furred partitions with adjustable bracket located at mid height.

I. Provide wood or metal bracing in partitions to receive and support fixtures, trim, accessories and other applied items.

J. Brace ceiling height partitions to structure at 48 inches on center maximum.

3.2 INSTALLATION OF CEILING FRAMING

A. Install in accordance with ASTM C754 and manufacturer's instructions.

B. Space hanger wires 48 inches on center maximum along runner channels and within 6 inches of ends of channels; secure to structure above.

C. Space runner channels 48 inches on center maximum and within 6 inches of abutting construction.
1. Position channels for ceiling height; level and saddle tie along channels.
2. Provide 1 inch clearance between channels and abutting construction.
3. Overlap channel ends 12 inches at splices; secure each end with double loop tie wire.

D. Space furring channels 16 inches on center maximum, perpendicular to runners and within 6 inches of abutting construction.
1. Provide 1 inch clearance between channels and abutting construction.

2. Secure to runners with clips on alternate sides of runners; saddle tie if clips cannot be alternated.
3. Overlap channel ends 8 inches at splices; secure each end with double loop tie wire.

E. Where openings interrupt furring or runner channels, install reinforcing to restore stability.

F. Provide double runner or furring channels side by side where [expansion and] control joints occur; do not continue channels over joints.

3.3 INSTALLATION OF CEILING FRAMING

A. Install in accordance with ASTM C636 and manufacturer's instructions.

B. Space hanger wires maximum 48 inches on center. Install additional hangers where required to support light fixtures and ceiling supported equipment.

C. Do not suspend hangers directly from metal deck. Attach steel channel horizontally to adjacent framing members; place hanger at regular spacing.

D. Hang suspension system independent of walls, columns, ducts, pipes, and conduit.

E. Where ducts or other equipment prevent regular spacing of hangers:
1. Reinforce nearest related hangers to span extra distance, or:
2. Suspend steel channel horizontally beneath duct or equipment; place hanger at regular spacing.

F. Install main tees at maximum 48 inches on center. Fully engage end locks.

G. Install cross tees perpendicular to main tees to form 24 x 48 inch modules. Lock cross tees to main tees.

3.4 INSTALLATION OF RESILIENT FURRING

A. Install channels perpendicular to framing spaced maximum 16 inches on center. Locate channels within 2 inches of floor and within 6 inches of ceiling.

B. Screw attach channels to each support.

C. Overlap channels minimum 2 inches at splices, centered over framing member. Screw attach to framing member through both flanges.

3.5 INSTALLATION OF WALL FURRING

A. Install in accordance with ASTM C754 and manufacturer's instructions.

B. Space channels 24 inches on center maximum and within 3 inches of corners; secure at maximum 24 inches on center with fasteners staggered on alternating flanges.

C. Nest channels minimum 8 inches at splices; secure with two fasteners in each flange.

3.6 INSTALLATION OF SHAFT WALL SYSTEM

A. Install in accordance with manufacturer's instructions.

B. Position tracks at floor and ceiling with short leg toward finish side of wall; attach at ends and 24 inches on center maximum.

C. If wall height exceeds maximum panel length, position panel end joints within upper or lower third of wall. Stagger joints top and bottom in adjacent panels; reinforce end joints with horizontal stud.

D. Install stud between tracks with liner inserted into stud groove.

E. Progressively install succeeding studs and liner panels.

F. Install full length studs vertically at intersections, door openings, corners, and ends of partitions.

G. Frame openings cut within a liner panel with track around perimeter.

H. Over doors, install horizontal track; attach to studs with clip angles and screws.

END OF SECTION

DIVISION 09 - FINISHES
SECTION 095100 - ACOUSTICAL TILE CEILINGS

1. SCOPE

1.1 This Contractor shall furnish all material, equipment, labor and incidental necessary items to completely install all acoustical tile or acoustical ceilings as shown on the drawings, called for in the finish schedule or specified herein.

1.2 This Contractor shall include all metal suspension systems and lay-in type tile necessary for the full completion.

1.3 This tile shall be installed over the entire area where shown.

2. MATERIAL

2.1 Lay-in ceiling board (except where Vinylrock is called for) shall be equal in every way to Armstrong Fissured Minaboard, 5/8" thick, Celotex Mineral Fissured Tile, or other equal incombustible boards.

Provide tegular edge tile where indicated in schedules.

2.2 All ceiling tile, except Vinylrock, shall be suspended in a "T" suspension system of enameled steel in 2' x 2' grid or 2' x 4' grid. See Reflected Ceiling plan for locations. Grid shall be white in color. Where Vinylrock is specified, grid shall be full aluminum. See Reflected ceiling plan for ceiling layouts.

2.3 Suspension system shall be equal to Eastern, USG Dorn or other approved suspension system, suspended with heavy wire hangers. Install preformed corners at bullnose block and rounded drywall corners.

2.4 Four wire hangers will be installed at each corner of electrical light fixtures to support electrical light fixtures.

2.5 This Contractor shall furnish all hangers, wall anchors, and other material necessary for the complete installation.

2.6 All tile shall be Class "A" flame resistant to meet UL Design #P259, items #14 and 16 and as approved by Underwriter's Laboratories.

2.7 Where Vinylrock ceiling is called for on finish schedule, furnish and install ceiling board equal to Acoustiflex Vinylrock, Type F-123 (washable fire-rated) in full aluminum "T" bar suspension system as specified above.

3. INSTALLATION

3.1 Install acoustical material and suspension system, including necessary hangers, grillage, splines and other supporting hardware, in accordance with ASTM C636 and manufacturer'* instructions. Allowable tolerances per ASTM C636.

3.2 Space hanger wires on main tees a maximum of 48" or as specified by UL fire resistance directory, attaching hangers directly to structure above. Do not support wires from mechanical or electrical

equipment, piping, or other equipment above ceiling. Provide additional hanger wires where lighting fixtures and/or air supply and return units occur in ceiling, minimum four hangers per each item for seismic installations.

3.3 Install hold down clips when panels weigh less than 1.0 lbs/ft 2 in fire rated installations and in seismic installations.

4. FINAL

4.1 The entire installation shall be left level and neat in perfect condition with all tees in straight lines in both directions.

4.2 Submit necessary shop drawings to Architect for approval indicating brand and method of grid installation including sample of ceiling panels used.

4.3 Upon completion of project; the contractor shall furnish to the Owner for his maintenance stock, 2 cartons (twenty-four pieces) of each type of acoustical material used.

END OF SECTION

DIVISION 09 - FINISHES
SECTION 096500 - RESILIENT BASE & ACCESSORIES

1. SCOPE

1.1 This Contractor shall furnish and install all vinyl composition tile, sheet vinyl, vinyl cove base, and non-skid surfacing as shown on drawings or called for herein.

2. MATERIAL

2.1 All tile, sheet vinyl, stair treads, risers, and stringers, vinyl reducers, base and safety type tile shall be in color and pattern as selected by Architect.

2.2 No Vinyl Tile this project.

2.3 No Sheet Vinyl this project.

2.4 Cove or straight base as shown on the drawing as vinyl base shall be standard, premium colors, full 1/8" thick, 4" or 6" in height unless otherwise shown on drawings or specified herein. See Room Finish Schedule for height. Colors as selected by Architect from Price Group I, II, III and/or IV.

A. **VB1 - Standard Cove base shall be Johnsonite or VPI Series 300 vinyl base or equal.**
VB2 – To be 6" Monark Millwork Base – See Room Finish and Flooring Schedules.

B. Cove base shall meet or exceed Federal Specification SS-40a, Classification II, Style "B".

C. Where vinyl base is specified to match existing, height, style and color shall match existing and shall be approved by Architect with samples submitted to Architect prior to placing order. Field verify.

2.5 All rubber stair treads shall be equal to Johnsonite Roundel Rubber VIRTR-RD (Visual Impaired) stair treads raised round pattern with square nosed treads 1/8" gauge. All rubber stair risers shall be equal to Johnsonite rubber risers 1/8" gauge thickness. All rubber stringers shall be equal to Johnsonite Rubber Stringers .080" gauge thickness.

A. All stair treads, risers and stringers shall be in colors and patterns as selected by Architect.

B. On all stairs 6' wide or smaller, the rubber tread will cover the full width of the stair with no joints.

C. On stairs wider than 6' there shall be one joint in the center of the tread only.

D. Landings – Provide rubber tile as indicated – Roundel pattern.

2.6 No Ramp Tile this project.

2.7 Provide vinyl reducer strips, style as required, where there is a change in floor heights or types. Vinyl reducer strips shall be equal to Johnsonite with colors selected by Architect.

2.8 Cove base nonflammable adhesive shall be Johnsonite #960 acrylic cove base adhesive, VPI #600 wall base adhesive, or approved equal, and shall be used in strict accordance with manufacturer's recommendations.

3. INSTALLATION

3.1 All concrete floors shall be at least 6 weeks old before any tile is installed.

3.2 Moisture test shall be applied as follows:

A. Sprinkle about 1/2 teaspoon of dry calcium chloride in center of 1/2" thick ring of putty.
B. Press small piece of glass (or glass tumbler) over putty in such manner as to exclude air from coming in contact with calcium chloride.
C. Putty ring should be about 3" in diameter.
D. Leave on floor for a minimum of 8 hours.
E. If calcium chloride is white and dry after this period, installation of tiles may proceed.
F. One of above test shall be used for each 3,000 square feet of concrete to be covered with tiles.
G. Architect shall be notified when results of these tests will be viewed to make arrangement for inspection of same with Flooring Contractor.

3.3 Any imperfection of concrete slab shall be reported to Architect before installation of tiles.

3.4 Adhesives shall be applied in strict accordance with manufacturer's recommendations over concrete or wood where applicable.

3.5 Inside and outside corners of vinyl base shall be formed on job from lengths of cove base, with minimum return of 6".

3.6 Remove any adhesive on surface of tiles and clean surface thoroughly.

3.7 Special care shall be taken where tiles butt against glazed tile base to be sure that joint is tight and performed in a neat manner.

4. FINAL

4.1 Suggested substitutions: Samples with manufacturer's specifications are to be submitted to the Architect for approval not later than 14 days before the bid date.

4.2 At the completion of the project, all tile, sheet vinyl, stair treads, risers, stringers, ramp tile and base shall be cleaned and shall be thoroughly inspected to be sure all corners are down tight, etc. and the floor is left in perfect condition.

4.3 Upon completion of the project, the Contractor shall provide the Owner with a quantity of 1% of floor tile and 1% of vinyl base and 1% of ramp tile, but not less than one carton, and all usable pieces of sheet vinyl one sq.yd. and larger of the total quantity used in each color and type and pattern on the job site for Owner's use.

END OF SECTION

DIVISION 9 – FINISHES
SECTION 096519 – LUXURY VINYL TILE FLOORING

PART 1 – GENERAL

1. SUBMITTALS
    a. Product Specification
    b. Specification for Adhesive
    c. Floor Layouts
    d. Samples
    e. Schedule
    f. Qualifications for Installer
    g. Extra Stock: Submit extra stock equal to 2% of total installed - minimum one box.
2. CLOSEOUT SUBMITTALS
    a. Maintenance Instructions
    b. Warranty
3. QUALITY ASSURANCE
    a. Environmental: FloorScore® Certified
    b. Installer Qualifications: Installer who has been trained in the installation of resilient sheet flooring.
    c. Mockups: Install 100 sf of product at designated location for architect review and approval.
4. MATERIAL STORAGE AND HANDLING
    a. Store tiles on a flat surface and squarely on top of one another.
    b. Store away from vents and direct sunlight.
    c. When palletizing, first place a 5/8" or thicker plywood on the pallet. Stack 2 rows high side by side with no airspace between. Then quarter turn for 2 rows side by side. Do not exceed 12 boxes high. If you are stacking pallets, use a 1" thick plywood in between pallets.
    d. Store in protected dry conditions between 65 and 85 degrees.
5. SITE CONDITIONS
    a. The permanent HVAC system must be on for 7 days prior to, during and after installation between 65 and 85 degrees Fahrenheit or 18 to 29 degrees Celsius.
    b. Material and adhesive must be acclimated to the installation area for a minimum of 48 hours prior to installation.

PART 2 – PRODUCTS

1. TESTING REQUIREMENTS
    a. Slip Resistance ASTM D2047: ADA Compliant
    b. Static Load Limit ASTM F970: 1500 psi
    c. Residual Indentation F1914: passes , 8%
    d. Flexibility ASTM F137: Passes
    e. Resistance to Heat ASTM F1514: Passes
    f. Resistance to Light ASTM F1515: Passes
    g. Resistance to Chemicals ASTM F925: Passes

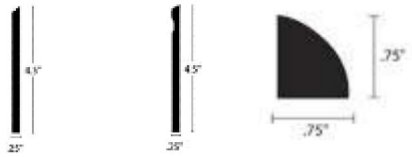
h. Radiant Flux ASTM E648: / 0.45 W/sq. cm., Class I
i. Smoke Density ASTM E662: Passes, <450

2. RESILIENT TILE
   a. Manufacturer: Shaw Contract
   b. Product: Grain 0502V
   c. Construction: High Performance Luxury Vinyl Plank
   d. Class ASTM F1700: Class III Printed Film Vinyl Plank
   e. Wear-layer Thickness: 20 mil or 0.020" (0.5 mm)
   f. Overall Thickness: 2.5 mm or 0.098"
   g. Nominal Dimensions: 7" wide x 48" long
   h. Finish: ExoGuard™
   i. Backing Class: Commercial Grade
   j. Installation: Glue Down

3. INSTALLATION MATERIALS
   a. Adhesives:

i. Shaw 4100 spreadable	95% RH		pH 7-10
ii. S150 spray	95% RH		pH 7-11
iii. Shaw 200 for low demand areas	90% RH	8 lbs	pH 7-10
iv. Shaw MM800 for Shift + Tilt	90% RH	8 lbs	pH 5-9

   b. Weld Rod
      i. Heat
      ii. Chemical
   c. Primer: Shaw 9050
   d. Leveling and Patching Compounds: Use only Portland-based patching and leveling compounds. Do not install resilient flooring over gypsum-based patching and/or leveling compounds.
   e. Take Abatement Coating: Shaw 6200
   f. Barrier Coat Floor Encapsulation: Shaw 9000
   g. Cove Base Accessories:
      i. Angle Profile
      ii. Detail Profile
      iii. Quarter Round Profile
   h. Floor Polish



PART 3 – EXECUTION

1. EXAMINATION
   a. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content, pH, smoothness and level.
   b. Proceed with installation after any unsatisfactory conditions have been corrected.
2. PREPARATION
   a. Concrete substrates should be tested for Internal Relative Humidity according to ASTM F 2170 and must not exceed 90% RH.
   b. The PH of the concrete sub-floor must be between 7 and 10.

c. Substrates shall be smooth, structurally sound, permanently dry, clean and free of all foreign material such as dust, wax, solvents, paint, grease, oils, old adhesive residue, curing and hardening/ curing compounds, sealers and other foreign material that might prevent adhesive bond.
d. Concrete floors shall be flat and smooth within 1/8" in 6 feet or 3/16" in 10 feet.

3. INSTALLATION
   a. LAYOUT AND INSTALLATION
   b. Install using conventional tile and plank installation techniques. Plank products should have a minimum of 6 to 8" seam stagger.
   c. Center rooms and hallways so borders are not less than half of a tile or plank.
   d. Work out of multiple boxes at the same time.
   e. In hallways and small spaces, work lengthwise from one end.
   f. Ensure cut edges are always against the wall.
   g. To cut products, score the top side of the material with a utility knife. Bend the product and finish the cut through the back side. It may be necessary to use a heat gun to cut around vertical obstructions. Allow the heated product to return to room temperature before installation.
   h. If you cut the product into a fine point, it may delaminate. Use an ethyl cyanoacrylate-based super glue to fuse the points together. Clean all glue from the top surface immediately. Alcohol-based super glues may cause the vinyl to swell.
   i. Roll the plank or tile with a 3-section 100 lb. roller. Re-roll the floor within the working time of the adhesive. Continue to roll the floor throughout the working day to ensure a proper bond.
   j. Use floor protection after installation. DO NOT use a plastic adhesive-based protection system.

4. MAINTENANCE
   a. Initial Maintenance
      i. Sweep, vacuum or dust mop to remove dirt and grit.
      ii. If needed, add neutral cleaner to cool water following the manufacturer's instructions.
      iii. Scrub with a low-rpm machine or auto scrubber. Use a red pad or brush.
      iv. Never use brown or black pads (too aggressive and can damage the product)
      v. Remove the cleaning solution with a wet-dry vacuum or auto scrubber until the floor is dry.
      vi. Rinse the floor with clean water. Repeat the rinse process if necessary to remove all haze.
   b. Routine Maintenance
      i. Sweep, vacuum or dust mop to remove dirt and grit.
      ii. Add neutral pH cleaner to cool water following the manufacturer's instructions.
      iii. As needed, scrub with a low-rpm machine or auto scrubber to retain appearance. Use a red (light scrubbing) pad and neutral cleaner following the manufacturer's instructions.
   c. Preventative Floor Care

i. Use walk-off mats that are as wide as the doorway and long enough for soil load and weather conditions.
ii. Use mats with a non-staining backing.
iii. Floor protectors should be used on all furniture legs.
iv. The surface area of the floor protectors should be no less than 1" in diameter.

d. Full maintenance instructions will be provided by the manufacturer.

END OF SECTION

DIVISION 09 - FINISHES
SECTION 097700 – SPECIAL WALL SURFACING

PART 1: GENERAL

1.01 Summary

A. Section Includes: Durable, decorative wall panels with smooth or textured finishes. Mounting hardware, adhesives, accessories and trims.

B. Related Sections:

1. Division 06 Section: Rough and Finish Carpentry.
2. Division 09 Section: Gypsum Board Assemblies.

1.02 References

A. General: Standards listed by reference, including revisions by issuing authority, form a part of this specification section to the extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.

B. ASTM International:

1. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
2. ASTM D256 Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.
3. ASTM D638 Standard Test Method for Tensile Properties of Plastics.
4. ASTM D790 Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
5. ASTM D2583 Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.

1.03 System Description

A. Performance Requirements: Provide durable, decorative wall panels which have been manufactured and installed to maintain performance criteria stated by manufacturer without defects, damage or failure.

1.04 Submittals

A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 011000 Submittal Procedures Section.

B. Product Data: Submit manufacturer's product data, storage, handling and preparation requirements and installation instructions.

C. Shop Drawings: Submit shop drawings showing layout, profiles and product components, including anchorage, accessories, finish colors, patterns and textures. Indicate location and dimension of joints and fastener attachment.

D. Samples: Submit selection and verification samples for finishes, colors and textures. Submit 2 samples of each type of panel, trim and fastener.

E. Quality Assurance/Control Submittals: Submit the following:

1. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
2. Certificates:
    a. Submit manufacturer's certificate that products meet or exceed specified requirements.
    b. Submit certificate of installer's qualifications.
3. Manufacturer's Instructions: Manufacturer's installation instructions.

F. Closeout Submittals: Submit the following:

1. Operations and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 01 Closeout Submittals (Maintenance Data and Operation Data) Section. Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance.
2. Warranty documents specified herein.

1.05 Quality Assurance

A. Installer Qualifications: Installer shall have a minimum of 5 years experience with composite wall panel work similar in scope and size to this project.

1.06 Delivery, Storage & Handling

A. General: Comply with Division 01 Product Requirements Section.

B. Lead Time: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

D. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.

1. Store panels indoors.
2. Lay panels flat. Do not stand panels on edge.
3. Protect panels from moisture.
4. Do not store panels in contact with the floor or against an outside wall.
5. Do not remove protective film from panel surface until after installation (if applicable).
6. Maintain optimum storage conditions of 60-75 degrees F (16-24 degrees C) at 35 - 55% relative humidity. Avoid extremes in temperature and humidity.

E. Handling: Remove foreign matter from face of panel by using a soft bristle brush, avoiding abrasive action.

1.07 Project/Site Conditions

A. Environmental Requirements:

1. Installation shall not begin until building is enclosed, permanent heating and cooling equipment is in operation and residual moisture from plaster, concrete or terrazzo work has dissipated.
2. Install panels between 60 degrees F - 75 degrees F (15 - 24 degrees C) and relative humidity below 55%, ideally at the same conditions as the room's normal operating temperatures after building is occupied.
3. Provide ventilation to disperse fumes during application of adhesive as recommended by adhesive manufacturer.
4. Do not install wall system until normal lighting conditions exist. Normal lighting conditions are described as those in place when the project is finished.

B. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

1. Wall, ceilings, floors and openings must be level, plumb, straight, in-line and square

1.08 Warranty

A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.

B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.

C. Warranty Period: [1] years commencing on Date of Substantial Completion.

1. Warranty extends to products assembled / installed and used in the manner intended and does not cover damage or failure caused by: misuse, abuse or accidents, exposure to extreme temperature, improper installation, improper maintenance and exposure to water or excessive humidity or excessive moisture.

PART 2: PRODUCTS

2.01 Composite Wall Panels

A. Manufacturer: Nudo

1. Contact: 1500 Taylor Avenue, Springfield, IL 62703; Telephone: (800) 826-4132, (217) 528-5636; Fax: (217) 528-8722; E-mail: info@nudo.com ; website: www.nudo.com

2. Equal products will be considered.

B. Products/Systems: Composite wall & ceiling panels, including the following:

SecureShield® Wall Panels:

SecureShield: Security wall panel combining 5/8" fire-rated gypsum, polycarbonate and optional fiberglass reinforced plastic (FRP) or PVC face.

Texture: [Unfinished, Smooth, Pebbled]
Thickness: 0.655" (5/8" gypsum with 0.030" polycarbonate)
Fire-Rating Class: A
Color: Standard Finish: To be selected by owner.
Black (806), Brown (277), Light Green (467), Yellow (334), Dark Gray (720), Pearl Gray (750), Blue (525), Bordeaux (139), Red (132), Orange (131), Beige (293), Khaki (203), Almond (698), White (050)
Size: 4 feet × 10 feet (1.2 × 3.0 m)

Physical Properties:

1) Flexural Strength (ASTM D790): 4,431
2) Flexural Modulus (ASTM D790): 46,502
3) Tensile Strength (ASTM D638): 1,048 psi.
4) Barcol Hardness (ASTM D2583): --
5) Izod Impact (ASTM D256): 5.54 ft-lb/in.
6) Surface Burning Characteristics (ASTM

END OF SECTION

DIVISION 09 - FINISHES
SECTION 099000 - PAINTING

1. SCOPE

1.1 The following specification covers the complete painting and finishing of all wood, iron, exposed piping, sheet metal (not prefinished), concrete block, and other surfaces throughout the interior and exterior of the building at locations where shown on plans.

1.2 The Painting Contractor shall supply all labor, materials, tools, ladder scaffolding and other equipment necessary for the completion of this work.

1.3 The Painting Contractor shall examine the specifications for the various trades and shall thoroughly familiarize himself with all their provisions regarding their painting. He shall understand that all surfaces that are left unfinished by the requirements of our specifications shall be painted or finished as a part of this contract.

1.4 Copper, bronze, chromium plate, nickel, stainless steel, prefinished metal, aluminum and Monel metal shall not be painted or finished except as otherwise specified.

1.5 If woodwork, metal, or any other surface to be finished cannot be put in proper condition for finishing by customary cleaning, sanding and puttying operations, the Painting Contractor shall immediately notify the General Contractor, Architect, or Owner in writing or assume responsibility for and rectify any unsatisfactory finish resulting.

1.6 All material used on the job shall be stored in a single place designated by the Owner or Architect. Such storage place shall be kept neat and clean and all damage thereto or to its surroundings shall be made good. Any oily rags, waste, etc., must be removed from the building every night, and every precaution taken to avoid the damage of fire.

2. MATERIALS

2.1 This specification is based upon material as furnished by ICI Dulux Paints.

2.2 Material of equal quality as manufactured by Pittsburg, Benjamin-Moore or Sherwin-Williams are approved.

2.3 Should the Painting Contractor desire to use paint other than that specified, he will submit to the Architect 14 days before bid date, in duplicate, a complete list of all the material he proposes to use. These materials will be compared to the materials specified, and if they are equal in quality, color and appearance, they will be approved.

2.4 All materials shall be delivered to the job in original containers with the seals unbroken and the label intact. All materials shall be used only as specified in the manufacturer's directions and in recommended quantities.

2.5 All colors (including deep tones) shall be selected or approved by the Architect. If required, three panels for finish and color shall be prepared in advance with the materials as specified, for the approval of the Architect.

2.6 Interior

A. All wood trim including wood doors shall be finished with one coat ICI Dulux, 1700 WOODPRIDE, Oil Wood Stain, color(s) selected by Architect; one coat of 1916 WOODPRIDE, Sanding Sealer and two coats 1902 WOODPRIDE, Satin Clear Finish, to be sanded between coats. All varnish and sealer shall be brushed on and no lacquer work will be accepted.

B. All exposed metal trim, i.e. handrails, hollow metal doors, hollow metal door frames, etc. shall be given one coat of ICI Dulux, 4160 DEVGUARD Multi- Purpose Metal Primer tinted with Dramatone colorants and two coats 1512 ULTRA-HIDE Alkyd Eggshell Enamel.

C. All exposed steel joists and steel deck where ceilings are not installed except where noted shall be spot primed on welds or scratches and then one coat of ICT Dulux, 1380 SPRAYMASTER Alkyd Flat Dryfall Spray Enamel paint applied.

1. All exposed steel, piping, conduit, and J-box shall be painted the same as adjacent wall, ceiling or surface unless otherwise noted.

D. All Haydite block, exposed concrete wall, and precast concrete panels shall be given one coat of ICI Dulux, 3010 ULTRA-HIDE Interior/Exterior Block Filler filler tinted with Dramatone colorants and two coats ICI Dulux, 1416 ULTRA-HIDE Latex Semi-Gloss Enamel tinted with Dramatone colorants (stippling rolled).

E. Devflex Coating where specified on Haydite Block, brick wall (where shown on drawings) exposed concrete and precast concrete panels where applicable shall be given one coat of ICI Dulux, 3010 ULTRA-HIDE Interior/Exterior Bloch Filler tinted with Dramatone colorants and two coats ICI Dulux, 4205 DEVFLEX interior/exterior acrylic latex semi-gloss enamel tinted with Dramatone colorants, applied stripping rolled or brushed in complete accordance with manufacturer's instructions.

F. All exposed gypsum board as finish surface unless noted otherwise shall have one coat ICI Dulux, 1000 DULUI-ULTRA Basecoat Interior Latex Wall Primer and two coats of ICI Dulux 1416 ULTRA-HIDE Latex Semi-Gloss Interior Wall and trim enamel.

G. Epoxy Coating specified on gypsum board as finish surface shall have one coat ICI Dulux 1020-1200 Prep & Prime Wall and Woodwork 100 Acrylic Interior Water based Primer Sealer and two coats ICI Dulux 4205 DEVFLEX Interior/Exterior Acrylic Latex Semi-Gloss Enamel.

H. Contractor shall verify all colors and match existing where noted.

I. Contractor shall allow approximately twenty-fine percent (25%) of all areas as vertical accent color panel and shall be included in base bid of this contract. Color shall be taped and finished at center of joints or corners of walls in a straight and neat manner, Architect will provide necessary drawings to painting contractor specifying location of accent colors prior to commencing work.

2.7 Exterior

A. All exposed metal including metal doors, frames, handrails, and exposed structural steel if not preprimed shall be given one coat ICI Dulux, 4160 DEVGUARD Multi-Purpose Metal Primer tinted with Dramatone colorants and two coats ICI Dulux, 4308 DEVGUARD Industrial Enamel, gloss.

B. All smooth face or split face block where specified to be painted shall be given one coat ICI Dulux, 3010 ULTRA-HIDE Interior/Exterior Block Filler tinted with Dramatone colorants and two coats ICI Dulux, 2406 DECRA- SHIELD Exterior Semi-Glass Finish, applied stippling rolled or brushed. Coating shall be heavy coating.

C. All exposed wood trim shall be given two coats ICI Dulux, 2610 WOODPRIDE Waterborne Semi-Transparent Stain.

D. Contractor shall verify all colors.

3. EXECUTION

3.1 Only skilled mechanics shall be employed and workmanship shall be of the very best quality.

3.2 All materials shall be applied under adequate illumination, evenly spread and smoothly flowed on without runs or sags.

3.3 All surfaces to be painted shall be cleaned free of loose dirt and dust before painting is started.

3.4 All knots, pitch streaks and sappy spots shall be first roughed up with ICI Dulux, 1110 ULTRA-HIDE Stain Jammer where the finish calls for interior paint or enamel. For exterior surfaces use ICI Dulux, 2110 ULTRA-HIDE Durus Exterior Alkyd Wood Primer.

3.5 All necessary puttying of nail holes, cracks, etc., shall be one after the first coat, with putty of a color to match that of the finish. Putty shall be brought flush with the adjoining surface 3n a neat and workmanlike manner.

3.6 All metal surfaces shall first be washed with mineral spirits to remove any dirt or grease before applying materials. Where rust or scale is present, it shall be wire brushed or sand papered clean before painting. Shop coats of paint that become marred shall be cleaned and touched-up with ICI Dulux Primer specified.

3.7 All scratches, cracks and abrasions in gypsum wall surfaces and openings adjoining trim shall be cut out as required, then filled with Spackle or other approved patching gypsum flush with adjoining gypsum surface, and when dry shall be sanded smooth and sealed before application of priming coat.

3.8 Paste wood filler applied on open grain wood when "set" shall be wiped across the grain of the wood, then with the grain to secure a clean surface.

3.9 Surfaces to be stained shall be covered with a uniform coat of stain and wiped off, if requested.

3.10 All undercoats of paint and enamel shall be tinted to the same or approximate shade of the final coat.

3.11 All woodwork to be finished with enamel or varnish, shall be sanded smooth and the surface cleaned before proceeding with the application of the first coat. Enamel or vanish finish applied to wood or metal shall be sanded between coats with fine sandpaper to produce an even, smooth finish.

3.12 All coats shall be thoroughly dry before applying succeeding coats.

3.13 All work where a coat of material has been applied, must be inspected and approved by the Architect before the application of the succeeding specified coat, otherwise, no credit for the coat applied will be given and the Contractor automatically assumes the responsibility to recoat the work in question.

3.14 The Painting Contractor will furnish the Architect a report of particular coat applied when completed for inspection and approval to comply with the above.

3.15 Tops, bottoms and edges of doors shall be finished same as balance of doors after' they are fitted by the carpenter.

3.16 Where the interior or exterior, wood and metal are primed in the mill or shop, the material shall be in every case that specified for such surfaces and shall be used in accordance with the manufacturer's directions for the first or priming coat.

3.17 The Painting Contractor shall not only protect his work at all times, but shall also protect all adjacent work and material by suitable covering or other method during progress of his work. Upon completion of the work, he shall remove all paint and varnish spots from the doors, glass and other surfaces. He shall remove from the premises all rubbish and accumulated material of whatever nature not caused by other trades and shall leave the work in clean, orderly and acceptable conditions.

END OF SECTION

DIVISION 10 - SPECIALTIES
SECTION 101400 – INTERIOR SIGNAGE – ADA SIGN PLAQUES

1. GENERAL

1.1 SECTION INCLUDES
A. Interior ADA-compliant panel/plaque signs.

1.2 RELATED SECTIONS
A. Section 10 11 00 – Visual Display Surfaces.
B. Section 10 13 00 - Directories.
C. Section 10 14 00 – Post and Panel / Pylon Signage.
D. Section 10 14 33 – Illuminated Panel Signage.
E. Section 10 14 36 - Non-Illuminated Panel Signage.

1.3 REFERENCES
A. ANSI A117.1: Providing Accessibility and Usability for Physically Handicapped People.
B. Department of Justice, Office of the Attorney General, "Americans with Disabilities Act", Public Law 101-336, (ADA).
C. 2010 Standards for Accessible Design (SAD): The updated ADAAG (ADA Accessibility Guidelines), effective on March 15, 2011 and made mandatory on March 16, 2012.

1.4 SUBMITTALS
A. Product Samples: One full size sign sample illustrating the design, construction, colors, typestyles, mounting method and other details as specified.
B. Drawings: Identifying all materials, sizes, construction details, graphics layouts, typestyle specifications and mounting methods.
C. Signage Schedule: Complete with location of each sign and the required copy/text.
D. Sign Program Maintenance Plan:
   1. Manufacturer shall provide details of an Online Reordering & Maintenance Application whereby the client can submit sign reorders online and store/view relevant project information such as signtype drawings, message schedules and product instructions.

1.5 QUALITY ASSURANCE
A. Manufacturer: Work required under this section from manufacturer regularly engaged in work of this type and scope for a minimum of 5 years.
B. Product Warranty: Provide manufacturer's warranty against defects in materials and workmanship for a minimum of 1 year.
C. Samples: One full size sign sample illustrating the design, construction, colors, typestyles, mounting method and other details as specified. Provide sample in small size sign.

1.6 DELIVERY, STORAGE & HANDLING
A. Package signs to prevent damage during shipment, handling, storage and installation. Products are to remain in their original packaging (unless otherwise specified) until removal is necessary for installation.
B. If installation site is not ready for signage upon delivery, store signs in a dry, air-conditioned environment.
C. Handle signage in accordance with manufacturer's instructions.

1.7 PERFORMANCE REQUIREMENTS
A. Provide signage that conforms to the requirements of all regulatory agencies holding jurisdiction.

B. Comply with all applicable provisions of the 2010 Standards for Accessible Design (the updated ADA Accessibility Guidelines, ADAAG), effective in March 2011. Requirements include, but are not limited to the following:
   1. Tactile copy must be all upper case and raised at least 1/32". Tactile characters must be san serif, not italic, not oblique, script or highly decorative.
   2. The stroke width of the upper case "I" has to be 15% of the letter height or less. The character width of the uppercase "O" must be between 55% and 110% of the height of the corresponding uppercase "I".
   3. The copy height for tactile information must be between 5/8" and 2". If separate visual characters are provided, raised characters can be ½" and need not contrast with the background.
   4. The distance between characters on tactile copy must be a minimum of 1/8" and a maximum of 4 times the character stroke width. These distances are measured between the closest points of adjacent characters.
   5. Spacing between lines of tactile copy needs to be a minimum of 135% and a maximum of 170% of the corresponding uppercase "I" height (measured from baseline to baseline).
   6. Braille must be Grade II and positioned directly below the corresponding raised characters. If text is multi-lined, Braille is placed below the entire body of text and separated 3/8" from any other tactile characters and 3/8" minimum from raised borders and decorative elements.
   7. Visual characters and symbols, and their background, are to have a non-glare finish. The color of raised characters must contrast as much as possible with their background to make sure signs are more legible for persons with low vision.
   8. Pictograms, selected from International Standards, are to be located within a 6" vertical void and accompanying text descriptions are to be located directly below the pictogram.

C. Provide signage that conforms to the requirements of all regulatory agencies holding jurisdiction.

2. PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Signage shall be manufactured by APCO Graphics, Inc. (a.k.a. APCO Signs or APCO USA), at 388 Grant Street SE, Atlanta, GA 30312.

2.2 ACCEPTABLE PRODUCT

A. APCO Process 1 ADA Plaque Series

B. Requests for substitutions will be considered only within the provisions of Section 01 25 00 and must conform to the quality, capabilities, performance and design intent as the specified APCO product.

2.3 PRODUCT DETAILS

A. Panel/Plaque Construction: PETG plaque featuring chemically fused layer of UV hardened, 1/32" thick raised Photopolymer characters and Braille chemically fused, not applied, to the PETG surface resulting in a single-piece construction. Laminated photopolymers, adhesive-applied characters and applied Braille dots are not acceptable.

B. Recycled Content: PETG base must contain a minimum 40% pre-consumer recycled content.

C. Typography: As selected from manufacturer's standards. Reference sign drawings and signage schedule for details. Manufacturer's standard ADA-compliant fonts to include, but shall not be limited to, the following:

1. Arial (ARADA)
2. BAVGarde-Normal (AGADA)
3. Frutiger-Normal (F55ADA)
4. HelveticaNeue-Roman (HRADA)
5. Myriad Pro (MPADA)

D. Colors and Finishes: As selected from manufacturer's standards. Reference sign drawings.
E. Overall Panel/Plaque Size: Specify height x width up to max 24in x 18in.
F. Panel/Plaque Thickness:
   1. .080 inch (standard)
G. Panel/Plaque Shape: Reference drawings.
H. Graphics: As selected from manufacturer's standards and as indicated in Signage Schedule for particular units; must meet ADA requirements for letter proportions, stroke thickness, sizes and inter-character spacing.

2.4 FABRICATION
A. Fabricate units as per specifications and details indicated on reviewed drawings.
B. All fabrication must take place in the USA.
C. Fabricate signs via a photopolymer process, using computer-generated film negatives for creation of crisp, UV-hardened raised characters and Braille. Engraved plaques, adhesive-applied raised characters and applied Braille are not acceptable.

3. EXECUTION

3.1 EXAMINATION
A. Do not begin installation until substrates have been properly prepared.
B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION
A. Clean surfaces thoroughly prior to installation.
B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION
A. Install products in accordance with manufacturer's instructions, in locations and with mounting methods as specified in sign and location drawings.
B. Square, plumb and level all installed products.
C. Install all signage in accordance with the 2010 Standard for Accessible Design (SAD), effective in March 2011, and any applicable local regulations and/or codes.
D. Installation Method:
   1. Concealed Vinyl Tape (VT): Must be VOC-free.
   2. Silicon Adhesive (SA)
E. Upon completion of the work, sign installer shall remove any unused products, materials, packaging and debris from the installation site.

3.4 CLEANING
A. Clean all exposed surface not more than 48 hours prior to Date of Substantial Completion in accordance with manufacturer's written cleaning instructions.

3.5 PROTECTION
A. Protect installed products until completion of project.
B. Touch-up, repair or replace damaged products before Substantial Completion.

3.6 SIGN SCHEDULES

A. Refer to Signage Schedule and Drawings for sizes, locations, sign types, layouts, typography specifications, sign text/copy and sign graphics.

END OF SECTION

DIVISION 10 - SPECIALTIES
SECTION 1014200 — CAST METAL LETTERS

1. General

1.1 Scope
- A. Furnish letters and hardware necessary to install cast letters*f*logos, shown on drawings and herein specified.

1.2 Submittals
- A. Manufacturer's illustrated product literature and specifications.
- B. Installation instructions

1.3 Quality Assurance
- A. Manufacturer to have a minimum of 25 years experience in manufacturing Letters*f*Logos.
- B. All letters to be manufactured by one manufacturer.

2. Products

2.1 Acceptable Manufacturer or Manufacturer's Representative
- A. Gemini Incorporated 103 Mensing Way Cannon Falls, MN 55009
  Phone: 800−538−8377 or 507−263−3957
  Fax: 800−421−1256 or 507−263−4887
  Email: sales@geminisignproducts.com Web: www.geminisignproducts.com
- B. Equal products by American, Woodland Mfg. accepted.

2.2 Materials (Metal Alloys)
- A. **Aluminum − 514 Alloy.**
- B. Bronze − NAVY G (lead and mercury free bronze) alloy.

2.3 Finishes (meeting ASTM G4A specifications)

A. Aluminum (Alloy #514)

1. Brushed: directionally sanded faces to a standard #2−#3 finish, (#4 finish optional), vertical grain direction (optional horizontal grain, random arc, or orbital sanded), bead−blasted returns, low−gloss clear powder coated, baked.
2. Painted: (standard or custom colors), directionally sanded faces, bead−blasted returns, liquid sprayed with a 2−part hardened acrylic polyurethane, oven baked to cure paint.
3. Clear Anodized: directionally sanded faces, bead−blasted returns, anodized to meet A31 Aluminum Architectural Class II anodized finish (.4−.7 mil), no clear coat.
4. Gold Anodized: directionally sanded faces, bead−blasted returns, anodized to meet A43 Aluminum Architectural Class I anodized finish (.7−1 mil), no clear coat.
5. Light Bronze Anodized: directionally sanded faces, bead−blasted returns, anodized to meet A44 Aluminum Architectural Class I anodized finish (.7−1mil), no clear coat.
6. Medium Bronze Anodized: directionally sanded faces, bead−blasted returns, anodized to meet A44 Aluminum Architectural Class I anodized finish (.7−1 mil), no clear coat.
7. Dark Bronze Anodized: directionally sanded faces, bead−blasted returns, anodized to meet A44 Aluminum Architectural Class I anodized finish (.7−1 mil), no clear coat.
8. Black Anodized: directionally sanded faces, bead−blasted returns, anodized to meet A44 Aluminum Architectural Class I anodized finish (.7−1mil), no clear coat.

9. Champagne Anodized: directionally sanded faces, bead–blasted returns, anodized to meet A44 Aluminum Architectural Class I anodized finish (.7–1mil), no clear coat.
10. Buffed (near–polish #6–#7 finish): buffed faces (not a mirror finish), bead blasted returns, sprayed with 2 –part hardened clear polyurethane, baked.
11. Rust Powder coated: directionally sanded faces, bead blasted returns, powder coated with Rust color paint, baked.

B. Bronze (NAVY G Alloy – lead & mercury free)

1. Brushed: directionally sanded faces, #2–#3 finish (#4 optional), vertical grain direction standard (horizontal optional), bead– blasted returns, sprayed with 2–part hardened acrylic polyurethane low–gloss clear coat, baked.
2. Polished US9 Finish: polished face — #8 Finish, bead–blasted returns, 2–part hardened acrylic polyurethane gloss clear coat, baked.
3. Light Oxidized US10B Finish: directionally sanded face (vertical standard), bead–blasted returns, oxidized, then faces are hand rubbed, directionally, to a light oxidized finish (exposing most bronze), returns left black, low–gloss clear coated, baked.
4. Oxidized US10B Finish: directionally sanded face (vertical standard), bead–blasted returns, oxidized, then faces are hand rubbed, directionally, to create an oxidized (antique) look (slightly exposed bronze), returns left black, low–gloss clear coated, baked.
5. Dark Oxidized US10B Finish: directionally sanded face, bead–blasted returns, oxidized, then faces are lightly hand rubbed , directionally, to create a Dark Bronze look (minimal bronze exposed), low–gloss clear coated, baked.
6. Traditional or Turquoise Patina: belt sanded face, faces and returns are chemically treated to create a colored patina look (finish will vary from letter to letter, not uniform), light clear coating, baked.

2.4 General Construction

A. Gemini cast Aluminum*f*Bronze Letters & Logos – in one of multiple company foundries.
B. Styles: Cast Letters are cast from either standard pattern styles, or custom styles per customer's vectorized art files.
C. Cast Letters are hand finished per order, per customer specifications. Face grain direction is standard at vertical – horizontal grain direction is optional.

2.5 Mounting Hardware & Options

A. Blind stud standard, available aligned for Brick, Block, Rail. Optional Single or Double Rail, Top or Bottom Rail, Bottom Angle Brackets, Top or Bottom Stud.
B. Letters under 15", drilled & tapped for 10–24 threaded studs. Thin strokes typical with 6–32 threaded studs.
C. Letters 15"+, drilled & tapped for 1*f*4–20 threaded studs (Aluminum studs with Alum letters, Stainless Steel studs with Bronze letters).
D. Aluminum spacer sleeves available upon request. Standard lengths per catalog offerings. Custom lengths upon request.

2.6 Manufacture

A. Cast metal letters shall be made of - Aluminum.
B. Letter shall be **(TBD)** letter style and shall be **14", 10" and 8"** inches high, as indicated on the drawings. 6 – LOCATIONS – SEE DRAWINGS
C. Finish shall be – **Brushed Aluminum**.
D. Mounting shall be **Blind Stud** with a Drilling pattern, designating stud locations.

3. Execution

3.1 Installation

A. A qualified installer shall install cast letters. Additional structural support may be required for larger/heavier Letters/Logos.

3.2 Warranty

A. Letters should be guaranteed for the life of the business against defects.

3.3 Maintenance

A. Cleaning of Letters/Logos as needed, per manufacturer's recommendations.

END OF SECTION

DIVISION 10 - SPECIALTIES
SECTION 102800 — TOILET, BATH AND LAUNDRY ACCESSORIES

1. SCOPE

1.1 This Contractor shall furnish all labor, material and equipment to install all toilet and bath accessories where shown on plans and as specified herein.

2. MATERIAL

2.0 Bobrick Products Listed – Equal products by American Specialties accepted.
Tile Redi Products Listed – Equal products by others accepted.

2.1 The following shall be provided and installed by the contractor where shown on the plans. Please also see the interior elevations and schedule.

A. Toilet Accessory schedule.
1. Paper Towel Dispenser – Bobrick B-262 or equal.
2. Mirror – Bobrick B-165 or equal – 24" x 36"
3. Grab Bar – 18" Vertical – Bobrick B-6806x18 or equal.
4. Grab Bar – 36" – Bobrick B-6806x36 or equal.
5. Grab Bar – 42" – Bobrick B-6806x42 or equal.
6. Single Roll Toilet Paper Dispenser – 1 required at each water closet. Bobrick B-2730 or equal.

B. The Following to be Provided by Plumbing Contractor or under Section 066116:

7. Solid Surface Lavatory – Single Bowl – By Cabinet Contractor
8. Solid Surface Lavatory – Double Bowl – By Cabinet Contractor
9. Pre-Fab Accessible Shower Unit – See MEP Plans – By Plumbing Contractor

3. FINAL

3.1 Contractor to install all items at locations and heights as called for on plans.

3.2 Upon completion of installation all units shall be cleaned and ready for Owner to install paper products.

END OF SECTION

DIVISION 10 - SPECIALTIES
SECTION 104400 - FIRE EXTINGUISHERS & CABINETS

1. SCOPE

1.1 Furnish and install all fire extinguishers and semi- recessed cabinets where shown on the drawings.

2. MATERIALS

2.1 Fire extinguishers shall be equal to Larsons #ABC-10 MP10 with 10A-60 BC UL rating, Underwriter's approved.

2.2 Fire extinguisher in kitchens shall be equal to Larsons #WC6L (K-CLS) with a 2A: 1B:C:K rating, Underwriters approved.

2.3 Fire extinguisher cabinets shall be equal to Model 2409-6R semi-recessed Architectural Series with full glass front and white finish. Use Model 2409 SM surface mount @ service areas / fire walls / concrete walls.

2.4 Cabinets shall be sized to fire extinguisher furnished.

2.5 Fire extinguisher shall be fully charged, complete installed and ready for use by the Owner.

2.6 Verify locations on drawings, all units to be installed at height as shown on drawings.

3. FINAL

3.1 Furnish shop drawings to Architect for approval before ordering.

END OF SECTION

DIVISION 10 - SPECIALTIES
SECTION 105600 – SHELVING AND CLOSET HARDWARE

1. GENERAL

1.1 SECTION INCLUDES
A. Shelf standards, brackets, and accessories.
B. Closet hardware and accessories.
C. Miscellaneous wall brackets and accessories.

1.2 RELATED SECTIONS
A. Section 06 20 00 - Finish Carpentry.
B. Section 06 41 00 - Architectural Woodwork.

1.3 REFERENCES
A. ANSI/BHMA A156.9, American National Standard for Cabinet Hardware.

1.4 DESIGN / PERFORMANCE REQUIREMENTS
A. Shelf standards and brackets meet or exceed the ANSI performance standards as established by ANSI/BHMA A156.9.

1.5 SUBMITTALS
A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

1.6 DELIVERY, STORAGE, AND HANDLING
A. Store products in manufacturer's unopened packaging until ready for installation.

1.7 WARRANTY
A. Provide manufacturer's limited lifetime warranty.
   1. EXTRA MATERIALS
B. See Section 01 60 00 - Product Requirements.

2. PRODUCTS

2.1 MANUFACTURERS
A. Acceptable Manufacturer: Knape & Vogt Mfg. Co., which is located at: 2700 Oak Industrial Dr. N.E. ; Grand Rapids, MI 49505-6083; Toll Free Tel: 800-253-1561; Tel: 616-459-3311; Fax: 616-459-0249; Email: request info (susan.hughes@kv.com); Web: www.kv.com
B. Substitutions: Equal products by other manufacturers will be considered.
C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.2 SHELVING SYSTEMS
A. Extra Duty Shelf Standards and Brackets:

1. Shelf Standard Components: Extra-Duty 85 Standard DOUBLE-slotted channel wall standards. Standards mounted to a suitable wall surface with mounting hardware 16 inches (406 mm) o.c. is capable of supporting 320 to 680 pounds per pair of standards when properly installed.
   a. Face: 1-1/4 inch (32 mm) wide by 1/2 inch (13 mm) deep, DOUBLE slotted.
   b. Material:
      1) Material and Finish: Steel, White, powder-coat; provide screws with matching heads, ROHS compliant.
   c. Lengths: As indicated on drawings.
   d. Lengths: As required to support shelving indicated.
2. Shelf Bracket Components: Steel, reinforced, locking into slots; size to suit shelves. Brackets adjustable in 1 inch (25.4 mm) increments along entire length of standard, drilled and countersunk for screws.
   a. Straight Shelf Brackets: Model 185: Steel, double lug pattern and double slot design to withstand high weight loads; locking into standards; same finish as standards.
3. Shelving:
   a. Shelving: As indicated on Drawings.
4. Cornice Brackets: Provide where cornices are indicated as part of shelving.
5. Shelf Rests: Model 106: Provide where shelves are indicated to join at shelf bracket.
6. Hang Rod Clamp: Model 107: Provide where garment rods are indicated to secure to shelf bracket.
7. Closet Rod: Provide where garment rods are indicated. (See 2.10 Closet Rods section).

2.3 SHELF BOARDS

B. Heavy Duty Decorative Shelf Boards: Heavy-Duty 1990 Decorative Shelf Boards consist of 3/4 inch (19 mm) thick shelf board with rounded front corners for desk and work surface applications.
   1. Performance: Supports up to 300 pounds when properly installed
   2. Finish and Sizes:
      b. White;
         1) Size as indicated on the Drawings.

2.4 ACCESSORIES

A. Closet Rods: Commercial grade steel; long-lasting, corrosion resistant finish. Meets and/or exceeds ANSI/BHMA weight load requirements.
   1. Round Closet Rod Tubing, Outside Diameter: 1-1/16 inches (27 mm):
      a. Model 750 1: 2.0 mm wall thickness; inside diameter: 29/32 inch (23 mm);
         1) Finish: Brilliant Chrome; premium double-plated finish, seamless, pit-free.

B. Closet Rod Flanges: Flanges of commercial grade steel; long-lasting, corrosion resistant finish. Meets and/or exceeds ANSI/BHMA weight load requirements.
   1. Closet Rods: Provide as required to suit rods indicated on the Drawings.
      a. Round Closet Rod Tubing, Outside Diameter: 1-1/16 inches (27 mm).
         1) Model 632 Line Bore Flange: Chrome. Two-5 mm pins for pre-drilled applications. One screw hole for extra mounting strength. Provide screws with matching heads.
         2) Size as indicated on the Drawings.

3. EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare components to receive hardware using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Mount standards to solid backing capable of supporting intended loads. Install standards using fasteners suitable for supporting intended loads.

C. Install brackets as indicated on the Drawings.

D. Install shelving, and accessories as indicated on the Drawings.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

DIVISION 10 - SPECIALTIES
SECTION 107310 – ALUMINUM WALKWAY COVERS

CUSTOM OVERHEAD SUPPORTED CANOPIES

1. General

1.1 Related Documents
- A. The requirements of Division 1 specifications shall apply to work specified in the section.

1.2 References
- A. International Building Code 2012
- B. ASCE 7-10 Minimum Design Loads for Buildings and Other Structures
- C. Aluminum Design Manual 2005
- D. Local governing codes and standards for site location

1.3 General Description of Work
- A. Work in this section shall include design, fabrication, and installation of aluminum protective covers. All work shall be in accordance with the shop drawings and this specification section.

1.4 Submittals
- A. Shop Drawings – Submit complete shop drawings sealed by a licensed engineer in the State of Missouri including:
  1. Overall canopy layout dimensions
  2. Cut section details including elevation, wall attachment details, and connection details
  3. Flashing details pertaining to aluminum canopy
  4. Canopy anchorage details
- B. Product Data – Submit manufacturer's product information, specifications, and installation instructions for the aluminum canopy.
- C. Samples – Submit color selection samples of actual coated aluminum material or actual anodized aluminum material.
- D. Certification – Provide letter of compliance certifying that the proposed canopy design and layout meets or exceeds all applicable loadings (ex: wind load, rain live load, dead load, snow load) for the job location (city & state) in accordance with IBC 2012 and ASCE 7-10.

1.5 Quality Assurance
- A. Manufacturer Qualifications: Minimum five years experience in design, fabrication, and production of aluminum protective covers.
- B. Components shall be assembled in shop to greatest extent possible to minimize field assembly.
- C. Aluminum protective cover, including material and workmanship, shall be warranted from defects for a period of one year from date of completion of aluminum protective cover installation.

2. Products and Materials

2.1 Acceptable Manufacturers

A. Mitchell Metals, LLC
1761 McCoba Drive, Suite A Smyrna, GA 30080
Phone 770.431.7300
Fax 770.431.7305
www.mitchellmetals.net

B. Equivalent systems by other manufacturers will be approved for substitution if the following conditions are met:
1. Meet all requirements listed in this specification.

2.2 Design & Assembly

A. Canopy shall use perimeter extruded gutter and extruded decking running perpendicular to wall being attached to. Extruded Decking shall be a roll-locked design where the extruded cap and pan shall interlock to make a rigid structure. Crimped decking is not allowed. Roll formed decking shall be allowed upon approval by the architect.

B. Canopy gutter frame shall be welded into a single frame unless shipping does not allow. If shipping does not allow, canopy frame shall be riveted together at the corners and caulked inside to make a water-tight frame.

C. Canopy shall be secured to the wall using a custom support rod system which uses 1" diameter galvanized round overhead support rods. The 1" diameter support rods shall have an eye bolt welded to each end. The canopy wall bracket shall be an eye bolt welded to the center of a 6"x6" galvanized plate. The 1" diameter support rod shall be connected to the wall bracket using a 7/8" galvanized Bolt, Nut, and Washers. The canopy frame shall have a galvanized saddle bracket with an eye bolt welded to the top of it. The 1" diameter support rod shall be connected to the saddle bracket using a 7/8" galvanized Bolt, Nut, and Washers.

D. Canopies shall drain from the decking to the perimeter gutter, and discharge from the bottom of the gutter out of a drain scupper. Downspouts can be used to drain the water from the overhead supported canopy to the ground upon the architect's request.

E. Canopy shall be pitched toward the scupper/downspout to allow proper drainage out of the canopy frame.

2.3 Materials

A. Support Rods
1. Support rods shall be fabricated from 1" diameter galvanized round rod.
2. Round rod shall have an eye bolt welded to each end to emulate a turnbuckle design.

B. Decking
1. Decking shall be a rigid roll-locked design that is self flashing and utilizes interlocking sections.
2. Extruded decking is to be of size indicated on architect's drawings.
3. Roll Formed is allowed upon the architect's approval
4. Where decking is run parallel to walkway, the ends of the pans shall be welded closed where decking does not terminate into a drain beam.

C. Gutter
1. Gutter shall be radius cornered aluminum extrusion of size indicated on architect's drawings. Minimum gutter size shall be 4"x 6" at 0.093" thick.

D. Flashing
   1. Flashing shall be made of aluminum sheet painted to match the color of the canopy. Minimum flashing thickness shall be 0.040" thick.

2.4 Fasteners
   A. All fasteners shall be stainless steel with neoprene washers and rivets are 3/16" aluminum.
   B. All connecting bolts shall be hot dipped galvanized.

2.5 Finishes
   A. Factory applied baked enamel
      1. Enamel is to comply with AAMA 2603.
      2. Color is to be as selected by architect from manufacturer's standard color chart.
      3. Custom colors can be used upon the architect's request.

3. Installation and Execution

3.1 Erection
   A. Canopies are to be installed according to approved shop drawings and plans.
   B. The entire structure shall be installed straight, true, and plumb according to standard construction procedures.
   C. All fasteners penetrating the building's face shall be caulked.
   D. Any blocking necessary to install the overhead supported canopy shall be installed by the General Contractor according to the approved shop drawings prior to canopy installation.
   E. Canopies shall be installed with positive and negative slope of 1/8" per foot to allow water drainage from top of canopy to draining scuppers/downspouts and eliminate ponding.
   F. All joints, corners, and connections shall be tight and clean.
   G. All exposed fasteners and galvanized members are to be painted to match the canopy color.
   H. Decking is to be aligned and secured to aluminum frame structure.

3.2 Cleaning
   A. All canopy surfaces exposed are to be cleaned after installation is complete.
   B. Surplus materials and debris shall be removed from the jobsite after installation is complete.

3.3 Protection
   A. General Contractor shall ensure protection of installed aluminum canopies from other construction so that canopies are without damage at time of substantial completion of project.

END OF SECTION

SECTION 220719
PLUMBING PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping insulation.

B. Jackets and accessories.

1.02 SUBMITTALS

A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

B. Do not provide information on mastics, adhesives, or additive coatings. Do not provide installation instructions, laboratory reports, MSDS sheets, or other misc. information.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER

A. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
   1. K Value: ASTM C177, 0.24 at 75 degrees F.
   2. Maximum Service Temperature: 850 degrees F.
   3. Maximum Moisture Absorption: 0.2 percent by volume.

B. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.

2.03 JACKETS

A. PVC Plastic.
   1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
      a. Thickness: 10 mil.
      b. Connections: Brush on welding adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with North American Insulation Manufacturers Association (NAIMA) National Insulation Standards.

C. Exposed Piping: Locate insulation and cover seams in least visible locations.

D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

E. Glass fiber insulated pipes conveying fluids below ambient temperature:
   1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
   2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

F. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

G. Glass fiber insulated pipes conveying fluids above ambient temperature:

1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

H. Inserts and Shields:
1. Application: Piping 1-1/2 inches diameter or larger.
2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
3. Insert Location: Between support shield and piping and under the finish jacket.

I. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions.

3.03 SCHEDULES

A. Plumbing Systems:
1. Domestic Hot Water Supply and Hot Water Return:
a. Glass Fiber Insulation:
1) Pipe Sizes 1 inch - 2 inch: Thickness: 1 inch.
2) Pipe Sizes 1/2 inch - 3/4 inch: Thickness: 1/2 inch.
2. Domestic Cold Water:
a. Glass Fiber Insulation:
1) Thickness: 1/2 inch.

END OF SECTION

SECTION 221005
PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe, pipe fittings, specialties, and connections for piping systems.
   1. Sanitary sewer.
   2. Domestic water.
   3. Natural Gas
   4. Pipe hangers and supports.
   5. Valves.

1.02 SUBMITTALS

A. Product Data: Provide data on pipe materials and fittings only. *Do not submit on Hanger information, Althread, anchors and clips, nuts, bolts, or PVC cement and primer. Provide general information on fittings, and do not include every fitting expected to be on the job.*

1.03 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 SANITARY SEWER PIPING, ABOVE GRADE

A. PVC Pipe: ASTM D2665
   1. Fittings: PVC.
   2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.03 DOMESTIC WATER PIPING, ABOVE GRADE

A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
   2. Joints: ASTM B32, alloy Sn95 solder up to and including 2" sizes

2.04 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
   1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
   2. Joints: Threaded or welded to ASME B31.1.

2.05 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.
   1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
   2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
   3. Vertical Pipe Support: Steel riser clamp.

B. Plumbing Piping - Drain, Waste, and Vent:
   1. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.

C. Plumbing Piping - Water:
   1. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Copper Clad, Malleable iron, adjustable swivel, split ring.
   2. Hangers for Cold Pipe Sizes 2 Inches and Over: Copper Clad, Carbon steel, adjustable, clevis.
   3. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

2.06 BALL VALVES

A. Construction, 2 Inches and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze body, 304 stainless steel or chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle[<>], threaded or grooved ends with union.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Install piping to maintain headroom, conserve space, and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

H. Provide access where valves and fittings are not exposed.

I. Install vent piping penetrating roofed areas to maintain integrity of roof assembly

J. Install valves with stems upright or horizontal, not inverted. Refer to Section 220523.

K. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.

L. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.

M. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.9.
   2. Support horizontal piping as indicated.
   3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
   4. Place hangers within 12 inches of each horizontal elbow.
   5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
   6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
   7. Provide copper plated hangers and supports for copper piping.

3.03 APPLICATION

A. Provide spring loaded check valves on discharge of water pumps.

B. Provide flow controls in water recirculating systems where indicated.

3.04 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Prior to starting work, verify system is complete, flushed and clean.

B. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.

C. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.

D. Maintain disinfectant in system for 24 hours.

END OF SECTION

SECTION 221006
PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Drains.

B. Cleanouts.

C. Water hammer arrestors.

1.02 SUBMITTALS

A. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

B. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

2.02 DRAINS

A. Floor Drain:
   1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer.

2.03 CLEANOUTS

A. Cleanouts at Interior Finished Floor Areas:
   1. Lacquered cast iron body with anchor flange, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.

2.04 WATER HAMMER ARRESTORS

A. Water Hammer Arrestors:
   1. Copper construction, piston type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range minus 100 to 300 degrees F and maximum 250 psi working pressure.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.

C. Install floor cleanouts at elevation to accommodate finished floor.

D. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to Lavatorys, sinks, ice makers, dishwasher supplies and water closet supplies, and as directed on the drawings.

END OF SECTION

SECTION 223000
PLUMBING EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. In-line circulator pumps.

1.02 SUBMITTALS

A. Product Data:
   1. Indicate pump type, capacity, power requirements. Indicate that pump meets design requirements for control.
   2. Provide electrical characteristics and connection requirements.

B. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

PART 2 PRODUCTS

2.01 IN-LINE CIRCULATOR PUMPS

A. Casing: Lead free bronze, rated for 125 psig working pressure.

B. Impeller: Bronze or Noryl.

C. Shaft: Ceramic, or Alloy steel with integral thrust collar and two oil lubricated bronze sleeve bearings.

D. Seal: Carbon rotating against a stationary ceramic seat.

E. Drive: Flexible coupling.

F. Provide with operating timer, and coordate operation time with Owner.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.

END OF SECTION

SECTION 224000
PLUMBING FIXTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water closets.

B. Urinals.

C. Lavatories.

D. Sinks.

E. Under-lavatory pipe supply covers.

F. Showers enclosure.

G. Shower valves, shower heads and accessories

1.02 SUBMITTALS

A. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

B. Maintenance Data: Include fixture trim exploded view and replacement parts lists.

C. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

PART 2 PRODUCTS

2.01 GENERAL

A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 TANK TYPE WATER CLOSETS

A. Bowl: ASME A112.19.2; floor mounted, siphon jet, vitreous china, 15 inches for non-ADA type, or 16.5 inches high for ADA type, close-coupled closet combination with elongated rim, insulated vitreous china closet tank with fittings and lever flushing valve, bolt caps,.
   1. Water Consumption: Maximum 1.6 gallons per flush.

B. Seat: Solid white plastic, open front, extended back, less cover, complete with self-sustaining hinge.

2.03 WALL HUNG URINALS

A. Flush Valves: ASME A112.18.1, Piston type , complete with vacuum breaker stops and accessories.

2.04 LAVATORIES

A. Lavatory bowl is integral with the countertop and is supplied by others. Plumbing contractor shall mount countertop with integral lavatory bowls, then install faucets and trim.

B. Supply Faucet: ASME A112.18.1; chrome plated combination supply fitting with open grid strainer, water economy aerator with maximum flow of 0.5 gpm through laminar flow outlet, ceramic disk cartridges, 4" wrist blade handles.

2.05 SINKS

A. Single Compartment Bowl: ASME A112.19.3; match dimensions on scheduled sink,18 gage thick, Type 304 stainless steel, self rimming and undercoated, with ledge back drilled for trim.
   1. Drain: 3-1/2 inch crumb cup and tailpiece.

2.06 UNDER-LAVATORY PIPE SUPPLY COVERS

A. General:
   1. Insulate exposed drainage piping including hot, cold and tempered water supplies under lavatories or sinks per ADA Standards.
   2. Exterior Surfaces: Smooth nonabsorbent with no finger recessed indentations for easy cleaning.
   3. Construction: 1/8 inch PVC with antimicrobial, antifungal and UV resistant properties.

a. Provide one piece injected molded design with internal bridge at top of J-bend to prevent separating.
b. Comply with ASTM E84 for flame and smoke development.
c. Comply with ASME A112.18.9 for covers on accessible lavatory piping.

4. Color: High gloss white.

2.07 SHOWERS

A. Shower: 5-piece ADA shower enclosure of Gelcoat Fiberglass Construction ,folding shower seat, grab bars and caulkless drain. Shower shall include wood backing for attachment of accessories. See plumbing fixture schedule on drawings for size.

B. Shower Trim: ASME A112.18.1; concealed single handle pressure balance shower valve, chrome plated, integral quarter turn stops. Provide chrome plated drop eared el, 30" slide bar, 60" long hose, and hand spray.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

B. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.02 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.03 INSTALLATION

A. Install each fixture with trap, easily removable for servicing and cleaning.

B. Install components level and plumb.

C. Install and secure fixtures in place with wall supports and bolts.

3.04 ADJUSTING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.05 CLEANING

A. Clean plumbing fixtures and equipment.

3.06 PROTECTION

A. Protect installed products from damage due to subsequent construction operations.

B. Do not permit use of fixtures by construction personnel.

C. Repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 230593
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

1.02 REFERENCE STANDARDS

A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition 2016.

B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems 2008 (Reaffirmed 2017).

C. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing 2002.

1.03 SUBMITTALS

A. Installer Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.

B. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
   1. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Engineer and for inclusion in operating and maintenance manuals.
   2. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
   3. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
   4. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
   5. Units of Measure: Report data in I-P (inch-pound) units only.
   6. Include the following on the title page of each report:
      a. Name of Testing, Adjusting, and Balancing Agency.
      b. Telephone number of Testing, Adjusting, and Balancing Agency.
      c. Project name.
      d. Project location.
      e. Project Engineer.
      f. Project Engineer.
      g. Project Contractor.
      h. Report date.

C. Project Record Documents: Record actual locations of flow measuring stations and balancing valves and rough setting.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:
   1. AABC (NSTSB), AABC National Standards for Total System Balance.
   2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
   3. SMACNA (TAB).

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. TAB Agency Qualifications:
   1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
   2. Having minimum of three years documented experience.
   3. Certified by one of the following:
      a. AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.

b. NEBB, National Environmental Balancing Bureau: www.nebb.org/#sle.
c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org/#sle.

D. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.02 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
1. Systems are started and operating in a safe and normal condition.
2. Temperature control systems are installed complete and operable.
3. Proper thermal overload protection is in place for electrical equipment.
4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
5. Duct systems are clean of debris.
6. Fans are rotating correctly.
7. Access doors are closed and duct end caps are in place.
8. Air outlets are installed and connected.
9. Duct system leakage is minimized.

B. Beginning of work means acceptance of existing conditions.

3.03 ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.04 RECORDING AND ADJUSTING

A. Ensure recorded data represents actual measured or observed conditions.

B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

C. Mark on drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.

D. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

E. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.05 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, outside air, and exhaust air quantities at site altitude.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

K. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure near the building entries.

3.06 SCOPE

A. Test, adjust, and balance the following:
   1. Building Static Pressure.
   2. Energy Recovery Units
   3. Fan Coil Units.
   4. Furnaces.
   5. Exhaust Fans.
   6. Air Inlets and Outlets-include supply, return, exhaust, and outdoor air devices such as grilles, diffusers, and control dampers.

3.07 MINIMUM DATA TO BE REPORTED

A. Building Static Pressure
   1. Static pressure at each building entrance.

B. Air Moving Equipment:
   1. Location.
   2. Manufacturer.
   3. Model number.
   4. Serial number.
   5. Air flow, specified and actual.
   6. Return air flow, specified and actual.
   7. Outside air flow, specified and actual.
   8. Total static pressure (total external), specified and actual.
   9. Inlet pressure.
   10. Discharge pressure.

C. Exhaust Fans:
   1. Location.
   2. Manufacturer.
   3. Model number.
   4. Serial number.
   5. Air flow, specified and actual.
   6. Total static pressure (total external), specified and actual.
   7. Inlet pressure.
   8. Discharge pressure.

D. Air Distribution Tests:
   1. Air terminal number.
   2. Room number/location.
   3. Terminal type.
   4. Terminal size.
   5. Area factor.
   6. Design velocity.
   7. Design air flow.
   8. Test (final) velocity.
   9. Test (final) air flow.
   10. Percent of design air flow.

END OF SECTION

SECTION 230713
DUCT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Duct insulation.

1.02 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus 2017.

B. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications 2013 (Reapproved 2019).

C. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material) 2019.

D. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials 2016.

E. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi 2015.

1.03 SUBMITTALS

A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section, with minimum three years of experience and approved by manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.06 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER, FLEXIBLE

A. Manufacturer:
   1. Johns Manville: www.jm.com.
   2. Knauf Insulation: www.knaufinsulation.com.
   3. Owens Corning Corporation: www.ocbuildingspec.com.
   4. CertainTeed Corporation: www.certainteed.com.

B. Insulation: ASTM C553; flexible, noncombustible blanket.
   1. 'K' value Installed: 0.25 at 75 degrees F, when tested in accordance with ASTM C518.
   2. Maximum Service Temperature: 250 degrees F.
   3. Maximum Water Vapor Absorption: 5.0 percent by weight.

C. Vapor Barrier Jacket:
   1. Kraft paper with glass fiber yarn and bonded to aluminized film.
   2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.

3. Secure with pressure sensitive tape.

D. Vapor Barrier Tape:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

A. Test ductwork for design pressure prior to applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Insulated Ducts Conveying Air Below Ambient Temperature:
   1. Provide insulation with vapor barrier jackets.
   2. Finish with tape and vapor barrier jacket.
   3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
   4. Insulate entire system, including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

D. External Duct Insulation Application:
   1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
   2. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
   3. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
   4. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

END OF SECTION

SECTION 230719
HVAC PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping insulation.

B. Jackets and accessories.

1.02 REFERENCE STANDARDS

A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2014.

B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric) 2014.

C. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form 2020a.

1.03 SUBMITTALS

A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than five years of documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum five years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.06 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturers:
   1. Aeroflex USA, Inc: www.aeroflexusa.com.
   2. Armacell LLC: www.armacell.us.
   3. K-Flex USA LLC: www.kflexusa.com.

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
   1. Minimum Service Temperature: Minus 40 degrees F.
   2. Maximum Service Temperature: 180 degrees F.
   3. Connection: Waterproof vapor barrier adhesive.

C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

2.03 JACKETS

A. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.
   1. Thickness: 0.016 inch sheet.
   2. Finish: Smooth.
   3. Joining: Longitudinal slip joints and 2 inch laps.
   4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
   5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

PART 3 EXECUTION

3.01 EXAMINATION

A. Test piping for design pressure, liquid tightness, and continuity prior to applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Cover pipes, fittings, and joints with aluminum jacket with seams located on bottom side of horizontal piping.

END OF SECTION

SECTION 232300
REFRIGERANT PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping.

B. Refrigerant.

C. Moisture and liquid indicators.

D. Valves.

E. Strainers.

F. Check valves.

G. Filter-driers.

1.02 REFERENCE STANDARDS

A. ASHRAE Std 15 - Safety Standard for Refrigeration Systems and Designation and Classification of Refrigerants 2019, with Errata (2020).

B. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes 2018.

C. ASME B31.5 - Refrigeration Piping and Heat Transfer Components 2020.

D. ICC (IMC)-2018 - International Mechanical Code 2018.

E. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation 2018.

F. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical Current Edition, Including All Revisions.

1.03 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

B. Provide pipe hangers and supports in accordance with ASME B31.5 unless indicated otherwise.

C. Liquid Indicators:
   1. Use line size liquid indicators in main liquid line leaving condenser.

D. Valves:
   1. Use service valves on suction and discharge of compressors.
   2. Use gauge taps at compressor inlet and outlet.
   3. Use check valves on compressor discharge.

E. Strainers:
   1. Use line size strainer upstream of each automatic valve.
   2. Use shut-off valve on each side of strainer.

F. Filter-Driers:
   1. Use a filter-drier immediately ahead of liquid-line controls, such as thermostatic expansion valves, solenoid valves, and moisture indicators.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum five years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store piping and specialties in shipping containers with labeling in place.

B. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.

C. Dehydrate and charge components such as piping and receivers, seal prior to shipment, until connected into system.

PART 2 PRODUCTS

2.01 PIPING

A. Copper Tube: ASTM B88 (ASTM B88M), Type L, annealed.
   1. Fittings: ASME B16.26 cast copper.
   2. Joints: Flared.
   3. Mechanical Press Sealed Fittings: Double pressed type complying with UL 207 and ICC (IMC)-2018.

B. Pipe Supports and Anchors:
   1. Provide hangers and supports that comply with MSS SP-58.
      a. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
   2. Hanger Rods: Mild steel threaded both ends or continuous threaded.

2.02 REFRIGERANT

2.03 MOISTURE AND LIQUID INDICATORS

A. Indicators: Single port type, UL listed, with copper or brass body, flared or solder ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap; for maximum temperature of 200 degrees F and maximum working pressure of 500 psi.

2.04 VALVES

A. Service Valves:
   1. Forged brass body with copper stubs, brass caps, removable valve core, integral ball check valve, flared or solder ends, for maximum pressure of 500 psi.

2.05 STRAINERS

A. Straight Line or Angle Line Type:
   1. Brass or steel shell, steel cap and flange, and replaceable cartridge, with screen of stainless steel wire or monel reinforced with brass; for maximum working pressure of 430 psi.

2.06 CHECK VALVES

A. Globe Type:
   1. Cast bronze or forged brass body, forged brass cap with neoprene seal, brass guide and disc holder, phosphor-bronze or stainless steel spring, teflon seat disc; for maximum temperature of 300 degrees F and maximum working pressure of 425 psi.

B. Straight Through Type:
   1. Brass body and disc, phosphor-bronze or stainless steel spring, neoprene seat; for maximum working pressure of 500 psi and maximum temperature of 200 degrees F.

2.07 FILTER-DRIERS

A. Performance:
   1. Pressure Drop: 2 psi, maximum, when operating at full connected evaporator capacity.
   2. Design Working Pressure: 350 psi, minimum.

B. Cores: Molded or loose-fill molecular sieve desiccant compatible with refrigerant, activated alumina, activated charcoal, and filtration to 40 microns, with secondary filtration to 20 microns; of construction that will not pass into refrigerant lines.

C. Construction: UL listed.
   1. Connections: As specified for applicable pipe type.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

A. Install refrigeration specialties in accordance with manufacturer's instructions.

B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.

C. Install piping to conserve building space and avoid interference with use of space.

D. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

E. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.5.

F. Provide clearance for installation of insulation and access to valves and fittings.

G. Flood piping system with nitrogen when brazing.

H. Where pipe support members are welded to structural building frame, brush clean, and apply one coat of zinc rich primer to welding.

I. Follow ASHRAE Std 15 procedures for charging and purging of systems and for disposal of refrigerant.

J. Provide replaceable cartridge filter-driers, with isolation valves and valved bypass.

K. Fully charge completed system with refrigerant after testing.

3.03 FIELD QUALITY CONTROL

A. Test refrigeration system in accordance with ASME B31.5.

END OF SECTION

SECTION 233100
HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal ductwork.

B. Nonmetal ductwork.

C. Duct cleaning.

1.02 RELATED REQUIREMENTS

A. Section 230713 - Duct Insulation: External insulation.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2014.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021.

D. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible 2005 (Revised 2009).

E. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors current edition, including all revisions.

1.04 SUBMITTALS

A. Product Data: Provide data for flexible duct only.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum three years of documented experience.

1.06 FIELD CONDITIONS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 PRODUCTS

2.01 DUCT ASSEMBLIES

A. Regulatory Requirements: Construct ductwork to comply with NFPA 90A standards.

B. Ducts: Galvanized steel, unless otherwise indicated.

C. Low Pressure Supply : 2 inch w.g. pressure class, galvanized steel.

D. Return: 1 inch w.g. pressure class, galvanized steel.

E. General Exhaust: 1 inch w.g. pressure class, galvanized steel.

2.02 MATERIALS

A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.

B. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
   1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
   2. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.

C. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.03 DUCTWORK FABRICATION

A. Fabricate and support in accordance with SMACNA (DCS) and as indicated.

B. Provide duct material, gauges, reinforcing, and sealing for operating pressures indicated.

C. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes of perforated metal with glass fiber insulation.

D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

E. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA (DCS).

2.04 MANUFACTURED DUCTWORK AND FITTINGS

A. Round Ducts: Round lockseam duct with galvanized steel outer wall.
   1. Manufacture in accordance with SMACNA (DCS).

B. Flexible Ducts: UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound spring steel wire.
   1. Insulation: Fiberglass insulation with polyethylene vapor barrier film. Insulation R value shall be as specified on plans and in section 23 0713 Duct Insulation.
   2. Pressure Rating: 16 inches WG positive and 1.0 inches WG negative.
   3. Maximum Velocity: 4000 fpm.
   4. Temperature Range: Minus 20 degrees F to 210 degrees F.

C. Transverse Duct Connection System: SMACNA "J" rated rigidly class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips in accordance with SMACNA (DCS).

PART 3 EXECUTION

3.01 INSTALLATION

A. Install, support, and seal ducts in accordance with SMACNA (DCS).

B. Install in accordance with manufacturer's instructions.

C. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

D. Flexible Ducts: Connect to metal ducts with draw bands.

E. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.

F. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

G. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.

H. Use double nuts and lock washers on threaded rod supports.

I. Connect diffusers to low pressure ducts directly or with 5 feet maximum length of flexible duct held in place with strap or clamp.

3.02 CLEANING

A. Clean metal duct systems with high power vacuum machines. Protect equipment that could be harmed by excessive dirt with filters, or bypass during cleaning. Provide adequate access into ductwork for cleaning purposes.

END OF SECTION

SECTION 233300
AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire dampers.

B. Flexible duct connectors.

C. Volume control dampers.

D. Low leakage control dampers.

1.02 REFERENCE STANDARDS

A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems 2018.

B. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible 2005 (Revised 2009).

C. UL 555 - Standard for Fire Dampers Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. Product Data: Provide assembly details, dimensions, and materials of construction.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum five years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect dampers from damage to operating linkages and blades.

PART 2 PRODUCTS

2.01 FIRE DAMPERS

A. Manufacturers:
   1. Louvers & Dampers, Inc, a brand of Mestek, Inc: www.louvers-dampers.com.
   2. Pottorff: www.pottorff.com.
   3. Ruskin Company: www.ruskin.com.

B. Fabricate in accordance with NFPA 90A and UL 555, and as indicated.

C. Curtain Type Dampers: Galvanized steel with interlocking blades. Provide for closure under air flow conditions. Configure with blades out of air stream.

D. Fusible Links: UL 33, separate at 165 degrees F.

2.02 FLEXIBLE DUCT CONNECTORS

A. Manufacturers:
   1. Carlisle HVAC Products: www.carlislehvac.com.
   2. Ductmate Industries, Inc, a DMI Company: www.ductmate.com.
   3. Elgen Manufacturing, Inc: www.elgenmfg.com.

B. Fabricate in accordance with SMACNA (DCS) and as indicated.

C. Flexible Duct Connections: Fabric crimped into metal edging strip.
   1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd.
      a. Net Fabric Width: Approximately 2 inches wide.
   2. Metal: 3 inches wide, 24 gauge, 0.0239 inch thick galvanized steel.

D. Maximum Installed Length: 14 inch.

2.03 VOLUME CONTROL DAMPERS

A. Manufacturers:
   1. Louvers & Dampers, Inc, a brand of Mestek, Inc: www.louvers-dampers.com.
   2. Pottorff: www.pottorff.com.
   3. Ruskin Company: www.ruskin.com.

B. Fabricate in accordance with SMACNA (DCS) and as indicated.

C. Single Blade Dampers:

1. Blade: 24 gauge, 0.0239 inch, minimum.

D. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 by 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
   1. Blade: 16 gauge, 0.0625 inch, minimum.

E. Quadrants:
   1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
   2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
   3. Where rod lengths exceed 30 inches provide regulator at both ends.

2.04 LOW LEAKAGE CONTROL DAMPERS

A. Manufacturers:
   1. Louvers & Dampers, Inc, a brand of Mestek, Inc: www.louvers-dampers.com.
   2. Pottorff: www.pottorff.com.
   3. Ruskin Company: www.ruskin.com.

B. Maximum Leakage Allowed: 1.5 cfm/sf at 1 inch wg.

C. Frame:
   1. Material: 20 gauge galvanized steel.

D. Blade:
   1. Type: As indicated on drawings.
   2. Operation: As indicated on drawings.
   3. Material: 14 gauge galvanized steel.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). Refer to Section 233100 for duct construction and pressure class.

B. Provide fire dampers at locations indicated, where ducts and outlets pass through fire rated components. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges. Provide duct access doors for inspection.

C. Demonstrate re-setting of fire dampers to Owner's representative.

D. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.

E. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.

F. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, unless dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION

SECTION 233423
HVAC POWER VENTILATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Ceiling exhaust fans.

B. Inline centrifugal fans.

1.02 REFERENCE STANDARDS

A. AMCA 99 - Standards Handbook 2016.

B. AMCA 204 - Balance Quality and Vibration Levels for Fans 2005 (Reaffirmed 2012).

C. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating 2016.

D. AMCA 300 - Reverberant Room Method for Sound Testing of Fans 2014.

E. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data 2014.

F. UL 705 - Power Ventilators Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. Product Data: Provide data on fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels at rated capacity, and electrical characteristics and connection requirements.

B. Operation and Maintenance Data: As a part of the Closeout Documents, include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum five years of documented experience.

1.05 FIELD CONDITIONS

A. Permanent ventilators may not be used for ventilation during construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Jenco Fan: www.jencofan.com

B. Loren Cook Company: www.lorencook.com.

C. PennBarry, Division of Air System Components: www.pennbarry.com.

D. Twin City Fan & Blower: www.tcf.com.

2.02 POWER VENTILATORS - GENERAL

A. Static and Dynamically Balanced: AMCA 204 - Balance Quality and Vibration Levels for Fans.

B. Performance Ratings: Determined in accordance with AMCA 210 and bearing the AMCA Certified Rating Seal.

C. Sound Ratings: AMCA 301, tested to AMCA 300 and bearing AMCA Certified Sound Rating Seal.

D. Fabrication: Comply with AMCA 99.

E. UL Compliance: UL listed and labeled, designed, manufactured, and tested in accordance with UL 705.

F. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

2.03 CEILING EXHAUST FANS

A. Centrifugal Fan Unit: Direct driven with galvanized steel housing lined with acoustic insulation, resilient mounted motor, gravity backdraft damper in discharge.

B. Grille: Aluminum with baked white enamel finish.

2.04 INLINE CENTRIFUGAL FANS

A. Centrifugal Fan Unit: Direct driven with galvanized steel housing lined with acoustic insulation, resilient mounted motor, gravity backdraft damper in discharge.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide backdraft dampers on outlet from cabinet and ceiling exhauster fans and as indicated.

END OF SECTION

SECTION 233700
AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Diffusers

B. Slot ceiling diffusers.

C. Registers/grilles

D. Roof hoods.

1.02 REFERENCE STANDARDS

A. ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Inlets 2006 (Reaffirmed 2011).

B. SMACNA (ASMM) - Architectural Sheet Metal Manual 2012.

C. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible 2005 (Revised 2009).

1.03 SUBMITTALS

A. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, airflow performance, application, and noise level.

1.04 QUALITY ASSURANCE

A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hart & Cooley, Inc: www.hartandcooley.com.

B. PennBarry: www.pennbarry.com

C. Price Industries: www.price-hvac.com.

D. Titus, a brand of Air Distribution Technologies: www.titus-hvac.com.

2.02 CEILING DIFFUSERS

A. Type: Provide square, plaque diffuser to discharge air in 360 degree pattern.

B. Connections: Round.

C. Frame: Provide inverted T-bar type.

D. Fabrication: Steel with baked enamel finish.

E. Accessories: Insulted back pan with vapor barrier where specified on plans.

2.03 PERFORATED FACE CEILING GRILLE

A. Type: Perforated face.

B. Frame: Inverted T-bar type.

C. Fabrication: Steel.

2.04 SLOT DIFFUSERS

A. Type: Continuous 1 inch wide slot, two slots wide, with adjustable vanes for left, right, or vertical discharge.

B. Fabrication: Aluminum extrusions with factory baked enamel finish.

C. Frame: 1-1/8 inch margin with concealed mounting and gasket, end cap.

D. Plenum: Integral, galvanized steel, insulated.

2.05 DUCT-MOUNTED SUPPLY GRILLES

A. Type: Louvered, 1/2 inch minimum depth, 1/2 inch maximum spacing with spring or other device to set blades, vertical face, double deflection.

B. Type: Streamlined and individually adjustable curved blades to discharge air along face of grille with two-way deflection.

C. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket.

D. Fabrication: Wall or duct mounted: Steel with 20 gage, 0.0359 inch minimum frames and 22 gage, 0.0299 inch minimum blades, steel with prime coat for feild painting or factory baked enamel finish.

E. Damper: Integral, gang-operated opposed blade type with removable key operator, operable from face.

2.06 DUCT-MOUNTED RETURN GRILLES

A. Type: Louvered, 1/2 inch minimum depth, 1/2 inch maximum spacing, horizontal face.

B. Frame: 1-1/4 inch margin with countersunk screw mounting.

C. Fabrication: Steel frames and blades, with factory prime coat for field paint or baked enamel finish per device schedule.

D. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

2.07 ROOF HOODS

A. Fabricate air inlet or exhaust hoods in accordance with SMACNA (DCS).

B. Fabricate of galvanized steel, minimum 16 gage, 0.0598 inch base and 20 gage, 0.0359 inch hood, or aluminum, minimum 16 gage, 0.0598 inch base and 18 gage, 0.0598 inch hood; suitably reinforced; with removable hood; birdscreen with 1/2 inch square mesh for exhaust and 3/4 inch for intake, and factory prime coat finish.

C. Mount unit on minimum 12 inch high insulated curb base with insulation between duct and curb.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Comply with SMACNA (ASMM) for flashing/counter-flashing of roof penetrations and supports for roof curbs and roof mounted equipment.

C. Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.

D. Install diffusers to ductwork with air tight connection.

E. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, unless dampers are specified as part of the diffuser, or grille and register assembly.

END OF SECTION

SECTION 237223
PACKAGED AIR-TO-AIR ENERGY RECOVERY UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Energy recovery units.

B. Casing.

C. Fans.

D. Enthalpy Transfer Medium.

E. Filters.

F. Dampers.

G. Power and controls.

1.02 REFERENCE STANDARDS

A. AHRI 1060 I-P - Performance Rating of Air-to-Air Exchangers for Energy Recovery Ventilation Equipment 2014.

B. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size 2017 (Amended (2020).

C. ASHRAE Std 84 - Method of Testing Air to Air Heat/Energy Exchangers 2020.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021.

E. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems 2018.

G. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. Product Data: Manufacturer's installation instruction, product data, and engineering calculations.

B. Closeout Submittals: Submit manufacturer's operation and maintenance instructions.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. Firm regularly engaged in manufacturing energy recovery units.
   2. Products in satisfactory use in similar service for not less than five years.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store in manufacturer's unopened packaging.

1.06 WARRANTY

A. Warranty ventilator to be free from defects in material and workmanship and of all parts for period of 1 from date of Substantial Completion.

B. Warranty dessicant core to be free from defects in material and workmanship for 10 years under circumstances of normal use.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Energy Recovery Ventilators:
   1. RenewAire: www.renewaire.com.
   2. Ruskin Company: www.ruskin.com.
   3. Semco Inc.: www.semcohvac.com.
   4. Trane Inc Mitsubishi: www.trane.com

2.02 ENERGY RECOVERY UNITS

A. Energy Recovery Units: Provide dessicant wheel type or stationary core air-to-air exchanger; prefabricated packaged system designed by manufacturer.

1. Provide unit with a AHRI 1060 I-P compliant air-to-air exchanger.
2. Permanent name plate listing manufacturer, model number, serial number, voltage, FCA data, and MCA data mounted inside door near electrical panel.

2.03 CASING

A. Wall, Floor, and Roof Panels:
   1. Construction: 1 inch thick, single wall box construction, with formed edges of exterior wall overlapping formed edges of interior wall.
   2. Exterior Wall: Galvanized steel sheet.
      a. 20 gauge, 0.0359 inch galvanized steel.
   3. Insulation:
      a. Foil/scrim faced 1 inch insulated fiberglass, minimum R-4.3 hr-ft2-degreeF/BTU.
      b. Flame Spread Index (FSI): 25 or less, when tested in accordance with ASTM E84 or UL 723.
      c. Smoke Developed Index (SDI): 50, maximum, when tested in accordance with ASTM E84 or UL 723.
   4. Panel Joints: T-shaped standing seams with overlapping metal caps.
   5. Isolation and Seal: Form continuous, thermally isolated, weather tight seal between inner wall of panels and structural framing with closed cell PVC foam gasketing.
   6. Seams: Sealed, requiring no caulking at job site.
   7. Coating: Baked powder paint.

B. Access Panels: Provide access to components through a large, tightly sealed and easily removable panel.

C. Doors:
   1. Construct doors of same construction and thickness as wall panels.
   2. Hardware:
      a. Hinged
      b. Corrosion-resistant.
      c. Gasket: Extruded neoprene.

2.04 FANS

A. Provide separate fans for exhaust and supply blowers.

B. Fans:
   1. Individually driven with a dedicated motor.
   2. AMCA-rated.
   3. Provide with non-overloading characteristics.

C. Housings: 12 gauge, 0.1046 inch aluminized steel with plenums integral to general housing and constructed to Class 1 fan standards.

D. Motors:
   1. Motors: Electronically Commutated.
   2. Efficiency: High.
   3. Fan Motor: UL listed and labeled.

2.05 ENTHALPY TRANSFER MEDIUM

A. Transfer heat and humidity from one air stream to the other with minimum carryover of the exhaust air into the supply air stream.

B. Effectiveness: Rated in accordance with ASHRAE Std 84 and AHRI 1060 I-P.

C. Flame Spread Index (FSI): 25 or less, when tested in accordance with ASTM E84 or UL 723.

D. Smoke Developed Index (SDI): 50 or less, when tested in accordance with ASTM E84 or UL 723.

E. Energy Recovery Wheel Media Face:
   1. Comply with NFPA 90A.

F. Cassette: Easily removable from the unit.

2.06 FILTERS

A. Exhaust and Fresh Air Streams: MERV 13 filters constructed to meet ASHRAE Std 52.2.

2.07 DAMPERS

A. Motorized Dampers: Provide motorized dampers for each airstream.
   1. Type: Motorized two position parallel blade damper with blade seals.
   2. Motorized Damper: Roll-formed structural hat channels, reinforced at the corners,
   3. Blades: Single skin, 16 gauge, 0.0598 inch.

2.08 POWER AND CONTROLS

A. Motor Control Panels: UL listed.

B. Include necessary motor starters, fuses, transformers and overload protection according to NFPA 70.

C. Provide single-point field connection to power supply.

D. Provide non fused main disconnect integral to control panel.

E. Install wiring in accordance with NFPA 70.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that structure is ready for installation of unit, that openings in deck for ductwork are correctly sized and located, and that mechanical and electrical utilities supplying unit are of correct capacities and are accessible.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions and requirements of local authorities having jurisdiction.

3.03 SYSTEM STARTUP

A. Provide services of manufacturer's authorized representative to provide start up of unit.

END OF SECTION

SECTION 238126.13
SMALL-CAPACITY SPLIT-SYSTEM AIR CONDITIONERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Forced air furnaces.

B. Air cooled condensing units.

C. Indoor air handling (fan and coil) units for ducted systems.

D. Indoor air handling (fan and coil) units for ductless systems.

E. Controls.

1.02 REFERENCE STANDARDS

A. AHRI 210/240 - Standard for Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment 2008, Including All Addenda.

B. ASHRAE Std 15 - Safety Standard for Refrigeration Systems and Designation and Classification of Refrigerants 2019, with Errata (2020).

C. ASHRAE Std 23.1 - Methods for Performance Testing Positive Displacement Refrigerant Compressors and Condensing Units that Operate at Subcritical Pressures of the Refrigerant 2019.

D. NFPA 54 - National Fuel Gas Code 2018.

E. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems 2018.

F. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems 2018.

G. NFPA 211 - Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances 2019.

H. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.

B. Shop Drawings: Indicate assembly, required clearances, and location and size of field connections.

C. Design Data: Indicate refrigerant pipe sizing.

D. Operation and Maintenance Data: Provide as closeout documents. Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

E. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years of experience and approved by manufacturer.

1.05 WARRANTY

A. Provide three year manufacturers warranty for solid state ignition modules.

B. Provide five year manufacturers warranty for heat exchangers.

C. Provide five year manufacturers warranty for electronic air cleaners.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Carrier Corporation: www.carrier.com.

B. Trane Inc Mitsubishi: www.trane.com.

C. York International Corporation / Johnson Controls-Corporate Office only: www.york.com.

2.02 SYSTEM DESIGN

A. Split-System Heating and Cooling Units: Self-contained, packaged, matched factory-engineered and assembled, pre-wired indoor and outdoor units; UL listed.
   1. Heat Pump: Heating and Cooling- Air-source electric heat pump located in outdoor unit with indoor evaporator.
   2. Split system with furnace:
      a. Heating: Natural Gas Fired.
      b. Cooling: Outdoor electric condensing unit with evaporator coil in central ducted indoor unit.
   3. Provide refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line.

B. Performance Requirements: See Schedule for all requirements.

2.03 INDOOR AIR HANDLING UNITS FOR DUCTED SYSTEMS

A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heating and cooling element(s), controls, and accessories; wired for single power connection with control transformer.
   1. Air Flow Configuration: upflow and horizontal.
   2. Cabinet: Steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.

B. Supply Fan: Direct drive centrifugal type with vibration isolation.

C. Air Filters: MERV 13, disposable type arranged for easy replacement.

D. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
   1. Construction and Ratings: In accordance with AHRI 210/240 and UL 207.

2.04 INDOOR AIR HANDLING UNITS FOR DUCTLESS SYSTEMS

A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, evaporator coil, and controls; wired for single power connection with control transformer.

B. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
   1. Construction and Ratings: In accordance with AHRI 210/240 and UL 207.

2.05 OUTDOOR UNITS

A. Outdoor Units: Self-contained, packaged, pre-wired unit consisting of cabinet, with compressor and condenser.
   1. Comply with AHRI 210/240.
   2. Refrigerant: R-410A.
   3. Cabinet: Galvanized steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.
   4. Construction and Ratings: In accordance with AHRI 210/240 with testing in accordance with ASHRAE Std 23.1 and UL 207.

B. Air Cooled Condenser: Aluminum fin and copper tube coil, AHRI 520 with direct drive axial propeller fan resiliently mounted, galvanized fan guard.

C. Accessories: Filter drier, high pressure switch (manual reset), low pressure switch (automatic reset), service valves and gauge ports, thermometer well (in liquid line).
   1. Provide thermostatic expansion valves.
   2. Provide heat pump reversing valves.

D. Mounting Supports: Provide equipment rails suitable for rooftop mounting.

2.06 GAS FURNACE COMPONENTS

A. Heat Exchanger: Aluminized and stainless steel tubular type.

B. Insulation: Foil-faced.

C. Burner: Atmospheric type with adjustable combustion air supply,
   1. Gas valve, two stage provides 100 percent safety gas shut-off; 24 volt combining pressure regulation, safety pilot, manual set (On-Off), pilot filtration, automatic electric valve.
   2. Combustion air damper with synchronous spring return damper motor.
   3. Non-corrosive combustion air blower with permanently lubricated motor.

D. Burner Safety Controls:
   1. Thermocouple Sensor: Prevents opening of gas valve until pilot flame is proven and stops gas flow on ignition failure.
   2. Flame Rollout Switch: Installed on burner box and prevents operation.
   3. Vent Safety Shutoff Sensor: Temperature sensor installed on draft hood and prevents operation, manual reset.
   4. Limit Control: Fixed stop at maximum permissible setting, de-energizes burner on excessive bonnet temperature, automatic resets.

E. Flue Termination: Concentric roof kit.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrates are ready for installation of units and openings are as indicated on shop drawings.

B. Verify that proper power supply is available and in correct location.

C. Verify that proper fuel supply is available for connection.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions and requirements of local authorities having jurisdiction.

B. Install in accordance with NFPA 90A and NFPA 90B.

C. Install gas fired furnaces in accordance with NFPA 54.

D. Provide vent connections in accordance with NFPA 211.

E. Install refrigeration systems in accordance with ASHRAE Std 15.

END OF SECTION

SECTION 26 32 13
PACKAGED ENGINE GENERATOR SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Packaged engine generator system

B. Control system

C. Package mounted radiator

D. Exhaust silencer and stainless flex

E. Battery and charger

F. Subbase or Integral fuel tank

G. Sound enclosure

H. Remote annunciator

I. Remote emergency stop

1.2 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Transfer switches

1.3 REFERENCES

A. ANSI/NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum)

B. ANSI/NEMA MG 1 - Motors and Generators

C. ANSI/NFPA 70 - National Electrical Code

D. ANSI/NFPA 99 - Health Care Facilities

E. ANSI/NEMA AB 1 - Molded Case/Electronic Circuit Breakers

F. NFPA 37 – Installation and Use of Stationary Combustion Engines and Gas Turbines

G. NFPA 110 – Emergency and Standby Power Systems

H. UL 94 HF1 – Enclosure Acoustic Flammability Rating

I. UL 2200 – Generator Set

J. EPA Emission Standards for Compressed Ignition Engines

K. AHJ – Authority Having Jurisdiction

L. Noise Emission: Comply with applicable state and local government requirements for

maximum noise level at property boundaries due to sound emitted by the generator set, its components and the operation thereof.

1.4 SYSTEM DESCRIPTION

A. Engine generator system to provide source of emergency and standby power.

B. System Capacity: As shown on drawings at an elevation of 1,000 feet above sea level, and ambient temperature between -20°F and 122°F; standby rating using engine-mounted radiator.

C. Operation: In accordance with NFPA 110.

1.5 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 16010.

B. Submit shop drawings showing plan and elevation views with overall and interconnection point dimensions, fuel consumption rate curves at various loads, ventilation and combustion air requirements, and electrical diagrams including schematic and interconnection diagrams.

C. Submit product data showing dimensions, weights, ratings, interconnection points, and internal wiring diagrams for engine, generator, radiator, control panel, battery, battery rack, battery charger, exhaust silencer, vibration isolators and remote annunciator. Include all accessory items specified.

D. Interconnecting wiring diagram of complete emergency system, including generator, remote radiator, cooling pumps, switchgear, battery charger, fuel system and remote alarm indications as the site specification dictates. These drawings shall be specific to the project component requirements and provided by the dealer. Factory drawings that provide multiple interconnections for items not specific to the project will be rejected.

E. Exhaust system calculations, in order to verify that the exhaust system does not violate the constraints of the generator maximum exhaust backpressure value when mounted indoor or package by an outside supplier other than the named manufacturer. A system supplied direct as a package from the major manufacturer are exempt from this requirement.

F. Submit certificates for compliance with EPA Emissions Standards for Compressed Ignition Engines.

G. Submit certificates for compliance with IBC System Seismic Certification.

H. Engine and generator combination transient report at rated power factor for specific model supplied, of voltage and frequency transient's response including recovery time at 50, 75 and 100% load application.

I. Manufacturers and dealer's written warranty disclosure statement for the period specified.

J. Warranty disclosure letter confirming the selling dealer is authorized to provide warranty repairs without using another service facility.

K. Submit manufacturer's installation instructions under provisions of Section 16010.

L. Authorized distributor shall provide copies of technician's factory training certificates specific to the proposed product on engine overhaul and electrical systems control repair in order to verify the level of support capabilities. Delegation of this service responsibility for any of the

equipment listed herein will not be considered fulfillment of these specifications. Major engine and control parts shall be available within 24 hours from the time a component is deemed defective.

1.6 PROJECT RECORD DOCUMENTS

A. Submit record documents under provisions of Section 16010.

B. Accurately record location of engine generator and mechanical and electrical connections.

1.7 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Section 16010.

B. Include instructions for normal operation, routine maintenance requirements, service manuals for engine and tank, oil sampling and analysis for engine wear, and emergency maintenance procedures.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in packaged engine generator system with minimum five (15) years documented experience.

B. Supplier: Authorized distributor of engine generator manufacturer with service and parts facilities within 150 miles of the project site.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Accept packaged engine generator set and accessories on site and verify any damage.

B. Protect equipment from dirt and moisture by securely wrapping in heavy plastic as required.

1.10 WARRANTY

A. The standby electric engine-generator and instrumentation panel from the factory shall be additionally warranted by the manufacturer against defective materials and factory workmanship for a period of **5year(s) Comprehensive with a 3,000 hour term**. Such defective parts shall be repaired or replaced at the manufacturer's option, free of charge **including** travel and labor.

1. Warranty level shall include all as shipped consist from the factory excluding filters, fluids, vee belts, hoses, paint and batteries.

1.11 EXTRA MATERIALS

A. Provide five (5) extra DC incandescent lamps and five (5) compact fluorescent lamps if provided.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide **Kohler Power Systems**, Diesel model 150REOZJF engine/generator set, rated 150 Kw / 188 kVA, 1800RPM, 120/240 VAC, 1-Phase, 60Hz, including fan and generator set peripheral

components/support.

1. Kohler Power Systems : Basis of Design
2. Cummins Power Generation
3. Caterpillar Electric Power
4. No substitutions, alternates will be allowed or accepted

2.2 PACKAGED ENGINE-GENERATOR SET

A. Packaged engine-generator set shall be a coordinated assembly of compatible components.

B. Safety Standard: Comply with ASME B15.1.

C. Nameplates: Each major system component shall be equipped with a nameplate to identify manufacturer's name and address, model and serial number, and component rating in integrated set and as required by the contract documents.

D. Mounting Frame: Adequate strength and rigidity to maintain alignment of mounted components without depending on concrete foundation. Mounting frame shall be free from sharp edges and corners and shall have lifting attachments arranged for lifting with slings without damaging components. Provide a rigging diagram permanently attached to the mounting frame to indicate the capacity of each lifting attachment and the generator-set center of gravity.

E. Factory load test shall be at .8 power factor prior to shipment.

2.3 ENGINE

A. Type: Water-cooled in-line or V-type, four-stroke cycle, diesel, internal combustion engine.

B. Rating: 150 kW Emergency Standby.

C. Fuel: Diesel

D. Engine Speed: 1800 RPM - Adjustable.

E. The prime mover shall be a liquid cooled, Diesel fueled, turbo charged, after cooled engine of 4-cycle design. The unit requires an operating speed of 1800 RPM.

1. Engine shall meet the current EPA Standards at the time of production.

F. Governor: Electronic engine control, Isochronous type with speed sensing. **Engine speed shall be adjustable and set at 60.1 HZ.**

G. Safety Devices: Engine shutdown on high water temperature, low oil pressure, overspeed, and engine overcrank. Limits as selected by manufacturer.

H. Frequency Response:

1. Steady State Operational Bandwidth: 0.5 percent of rated frequency from no load to full load.

2. Transient Response: Less than 15 percent voltage dip for a 75 percent step-load increase or decrease. Frequency shall not exceed 15 per cent and shall recover and remain within the steady state operating band within 3 seconds. Verify compliance with bid documents.

I. Fuel System: Engine mounted diesel fuel injection system.

J. Lubrication System: Engine or skid mounted filter and strainer, thermostatic control valve capable of full flow and designed to be fail safe, and crankcase drain arranged for gravity drainage with siphon or pump.

K. Engine Jacket Heater: Thermal circulation type water heater with integral thermostatic control, sized to maintain engine jacket water above 100°F, and suitable for operation on 120 Volts AC, single phase. The minimum wattage of the heater shall be 1.5 kw.

L. Radiator Cooling System: Closed loop and integral engine-driven coolant pump.

1. Coolant: Solution of 50 percent Extended Life Coolant (ELC) and 50 percent water, with anti-corrosive additives.

M. Engine Starting: DC starting system with positive engagement, number and voltage of starter motors in accordance with manufacturer's instructions. Include remote starting control circuit, with MANUAL-OFF-REMOTE selector on engine-generator control panel. Provide the following accessories:

1. Battery: Minimum 1- 640 CCA. Voltage to match starter with capacity for three cranking cycles without recharge. Provide with battery cables and acid resistant battery tray, seismic rated.

2. Battery-Charging Alternator: 45A factory mounted on engine with solid state voltage regulation.

3. Battery Charger: Current limiting type, 10 amp minimum, designed to float at 2.17 volts per cell and equalize at 2.33 volts per cell. Include overload protection, full wave rectifier, DC voltmeter, ammeter or LED indication, and 120 volts AC fused input. Provide wall-mounted enclosure to meet ANSI/NEMA 250, Type 1 requirements.

a. Include NFPA 110 Level I alarms.

N. Exhaust System: Critical type silencer, side inlet with muffler companion flanges and flexible stainless steel exhaust fitting, suitable for horizontal orientation, sized in accordance with engine manufacturer's instructions. Silencer to mount above the unit.

O. Engine Accessories: Fuel filter, lube oil filter, intake air filter, lube oil cooler, belt driven water pump.

1. Crankcase vent shall be plumbed exterior to the enclosure as required.

2.4 GENERATOR

A. Generator: ANSI/NEMA MG 1; single phase, brushless synchronous generator with brushless exciter and PMG generator excitation. Comply with parameters set below to reduce site voltage dip.

B. Rating: Standby. Model 4T13X

C. Voltage : 120/240 Vac

D. Excitation Type : Permanent Magnet

E. Insulation: ANSI/NEMA MG 1, Class H.

F. UL2200 Minimum Oversized Generator Rating: 152 KW 152 KVA

G. Temperature Rise By Resistance: 125° C at 40° C ambient.

H. Minimum SKVA at 20% Voltage Dip: 225

I. Enclosure: ANSI/NEMA MG 1; open drip-proof. Voltage Regulation: Digital

1. Include solid-state type voltage regulator, separate from exciter to match engine and generator characteristics, with voltage regulation ± .5 percent from no load to full load.

J. Subtransient Reactance (X"d): Maximum 10.0 %.

K. Windings: Optimum pitch Random Wound winding.

2.5 CONTROLS AND INDICATION

A. Operating and safety indications, protective devices, basic system controls, and engine gauges shall be grouped in a common control and monitoring panel mounted on the generator set. Mounting method shall isolate the control panel from generator–set vibration.

B. The engine-generator set shall contain a complete 2-wire automatic engine start-stop control which starts the engine on closing contacts and stop the engine on closing contacts. A cyclic cranking limiter shall be provided to open the staring circuit after eight attempts if the engine has not started within that time. Engine control modules must be solid state plug-in type for high reliability and easy service. The engine controls shall also include a 3-position digital selector with the following positions: OFF/ON/AUTO.

C. The panel shall include; digital monitor of AC voltage, AC current and AC frequency with a phase selector button, an emergency stop switch, an audible alarm and a programmable engine control and monitoring module.

D. The programmable module shall include: a manual, off auto touch pad; four LEDs to indicate 1) Not in Auto, 2) Alarm Active, 3) Generator Running, 4) Generator Ready; a data entry keypad and a digital display panel.

E. A generator run relay and common fault relay with dry contacts shall also be provided for customer use.

F. The module will store and display all pertinent unit parameters including.

1. Generator Status

a. Current unit status in real time

2. Instrumentation

a. Available Data Points

1) Oil pressure
2) Coolant temperature
3) DC battery voltage
4) Engine RPM
5) Twenty (20) event fault log
6) Engine hours
7) Engine successful start counter
8) Engine crank attempt counter
9) Service Maintenance Interval
10) Fuel Consumption gal/hr
11) Total Fuel Consumed

b. Available Data Points via technician computer when applicable

12) Air filter differential pressure
13) Boost pressure
14) Engine crankcase pressure
15) Engine exhaust temperature (L & R)
16) Engine intake manifold temperature
17) Engine oil temperature
18) Fuel filter differential
19) Fuel pressure
20) Fuel pressure
21) Oil filter differential pressure
22) Oil temperature

c. Viewing of all Instrumentation Digital

1) AC L-L voltages
2) AC L-N voltages
3) All AC Line Current
4) Frequency

d. Instrumentation Digital (Additional)

1) Kw (total and per phase)
2) Kva (total and per phase)
3) kVAr (total and per phase)
4) Power Factor (overall and per phase)
5) kW hours
6) KvarHours
7) Kvars

3. Generator Commands

a. Current engine start/stop status

4. Alarm Status

a. Current alarm(s) condition
b. Overcrank
c. Low coolant temperature warning
d. High coolant temperature warning / shutdown
e. Low coolant warning / shutdown
f. Low oil pressure warning / shutdown
g. Overspeed

h. Control switch not in auto
i. High/Low battery voltage
j. Emergency stop activated
k. Over Under voltage
l. Over Under frequency
m. Reverse power
n. Overcurrent

5. Alarm Status via technician computer

a. Low fuel pressure warning / shutdown
b. High fuel pressure warning / shutdown
c. Fuel filter restriction warning / shutdown
d. High intake manifold air temperature warning / shutdown

6. NFPA 110 Local Panel Annunciator, Level 1 and shall include the following

a. Overcrank
b. Low water (engine) temperature
c. High engine temperature prealarm and high engine temperature
d. Low lube oil pressure prealarm and low lube oil pressure
e. Overspeed
f. Low fuel main tank
g. Low coolant level
h. Not in auto
i. Emergency Power Supply (EPS) supplying load
j. High battery voltage
k. Low battery voltage
l. Battery charger failure (includes AC failure)
m. Emergency stop and Emergency Power Off Switch activated (EPO)
n. Spare
o. Spare

7. The panel must be accessible by PC based software via RS485 MODBUS RTU protocol. The software must display the module face, be updated in real time and allow for complete access to all module functions. Communication output and its software must be fully compatible and allow for incorporation into an existing control program.

2.6 OUTDOOR GENERATOR-SET ENCLOSURE

A. Vandal-resistant, weatherproof, walk-around Steel housing, designed for the extreme weather conditions on-site. Multiple panels are lockable and provide adequate access to components requiring maintenance. Panels are removable by one person without tools. Instruments and controls are mounted within enclosure. The entire generator assembly including enclosure shall be suitable for installation and operation in the outdoor location shown which is accessible to the general public. All protective devices and equipment shall be an integral part of the package. All openings shall be protected and shall prevent accidental contact with energized, rotating or otherwise hazardous parts of equipment.

B. Construction: Minimum 14-gauge, metal-clad, integral structural-ALUMINUM framed enclosure erected on concrete foundation.

C. Paint: Shall be supplied with advanced corrosion and abrasion protection as well as enhanced edge coverage and color retention.

D. Structural Design & Anchorage: Adequate to resist loads imposed by wind, and other structural loads, including roof, seismic, snow and auxiliary loads as required.

E. Sound Attenuation: The entire enclosure except for the louvered openings shall have sound attenuation material mechanically attached to the interior surfaces of the unit. The sound absorption material shall be held in place by a perforated sheeting to form a removable section easily inspected by maintenance personnel. The sound attenuation material and fastening system shall apply to the enclosure roof as well as the side panels and doors. The enclosure package shall be designed to achieve a:

1. 75 dBA maximum sound rating when measured at a distance of 23 feet.

2. Acoustic insulation shall meet UL 94 HF 1 flammability classification and repel moisture absorption.

F. Base and Mounting: The generator set and enclosure shall be mounted and shipped to the jobsite on a common structural steel sub-base. Provisions for crane unloading of the complete package shall be designed into the base of the unit.

The base and enclosure assembly shall allow room within the package to mount and maintain the specified battery charger, engine starting batteries, racks, and cables, generator mounted mainline circuit breaker(s), the engine/generator control panel, and other items as specified and as required for a complete system.

The entire unit consisting of generator set, base, enclosure, and all other specified items including all liquids (i.e., fuel oil (diesel), lube oil and cooling water) shall be calculated by the manufacturer. The base of the unit shall be engineered, designed, and manufactured as a heavy duty, welded steel construction with four (4) point lifting provisions as used on heavy duty construction installations. Details and manufacturer's certification of the base construction shall be included with the drawings submitted for approval.

Enclosure Flooring: The floor of the enclosure shall be designed and constructed in such a manner as to prevent the entrance of rodents.

2.7 ACCESSORIES

A. A main electronic 100% rated LSI, UL listed main line circuit breaker rated as specified and must be mounted in the AC connection panel. The line side connections are to be made at the factory.

1. 250 amp frame, 200 amp trip

2. Shunt Trip

3. Mounted at right side of generator end box.

4. Shall be bottom cable entry compatible.

B. A second main electronic 100% rated LSI, UL listed main line circuit breaker rated as specified and must be mounted in the AC connection panel. The line side connections are to be made at the factory.

1. 400 amp frame, 400 amp trip

2. Shunt Trip

3. Mounted at right side of generator end box.

4. Shall be bottom cable entry compatible

C. A third electronic 100% rated Thermal Mag, UL listed load bank circuit breaker rated as specified and must be mounted in the AC connection panel. The line side connections are to be made at the factory.

1. 600amp trip

2. Mounted at left side of generator end box.

3. Shall be bottom cable entry compatible

D. Remote Manual Stop Station (Emergency Power Off EPO): Provide a remote manual stop station with weather proof stainless steel or die cast housing, red mushroom button - push to stop operation, breakable cover/lens to access mushroom button, 120 volt rated. The manufacturer shall provide automatic monitoring of the EPO switch. Placing the EPO switch in the "Generator Powered OFF" status shall initiate a visual and audible alarm at each generator annunciator panel for each location listed.

1. Nema 3R

2. Lockable per current NEC requirements.

3. Location shown in drawings.

E. Remote Engine Annunciator Panel: ANSI/NFPA 99 and NFPA 110 for a Level 1 system. Include the listed pre-alarm and alarm points, audible alarm, alarm silencing means, repetitive alarm circuitry, and lamp test switch in a flush mounted panel with brushed stainless-steel finish. Provide all interconnecting wiring in conduit per manufacturer's requirements by the Electrical Contractor. Annunciator panel shall be able to communicate up to 2000'. The remote annunciator(s) shall be mounted in the following locations:

1. Location shown in drawings.

2. The remotely reported alarms shall include the following.

a. Overcrank

b. Low water (engine) temperature

c. High engine temperature prealarm and high engine temperature

d. Low lube oil pressure prealarm and low lube oil pressure

e. Overspeed

f. Low fuel main tank

g. Low coolant level

h. Not in auto

i. Emergency Power Supply (EPS) supplying load

j. High battery voltage

k. Low battery voltage

l. Battery charger failure (includes AC failure)

m. Emergency stop and Emergency Power Off Switch activated (EPO)

n. Spare

o. Spare

p. Spare

q. ATS 1 Switch Position: In Normal

r. ATS 1 Switch Position: In Emergency

s. ATS 1 Normal Source: Available

t. ATS 1 Emergency Source: Available

u. ATS 1 Lockable Test Switch

v. ATS 2 Switch Position: In Normal

w. ATS 2 Switch Position: In Emergency

x. ATS 2 Normal Source: Available

y. ATS 2 Emergency Source: Available

z. ATS 2 Lockable Test Switch

F. Subbase/Integral Tank: Steel Construction: subbase/integral tank shall be UL 142 listed and be provided with double walls. Both inner and outer tanks shall have a normal and emergency vent and have all threaded connections located on the tank top (except the overflow, drains, and double wall vent), with the inner tank piped through the outer shell.

1. Tank shall be sized to hold 298 gallons of diesel fuel total.

2. Tank useable capacity minimum of 280 gallons.

3. 5 gallon spill containment box w 95% fuel shutoff.

4. Fuel level gauge.

5. Heavy-duty float switch Low Fuel Level.

6. Heavy duty float switch Leak Detection

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive work and field dimensions are as shown on the drawings.

B. Verify that required utilities are available in proper location and ready for use.

C. Beginning of installation means installer accepts existing conditions.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install remote manual stop station in location shown on plans. Provide 24V DC power wiring in conduit as required. Coordinate installation with the manufacturer approved shop drawings and wiring diagrams. The remote manual stop station shall shunt trip the generator circuit breaker (low voltage only) when provided and signal the engine prime mover to stop.

3.3 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 16010 and in compliance with NFPA 110 requirements.

B. Provide portable test bank for full load test. Simulate power failure including operation of transfer switch, automatic starting cycle, and automatic shutdown, and return to normal.

C. Fill fuel tank prior to start of test (by installing contractor). This is waived if the system is filled/supplied by an on-site fuel source.

D. The on-site installation test shall be conducted as follows:

1. With the prime mover in a “cold start” condition and the emergency load at standard operating level, a primary power failure shall be initiated by opening all switches or breakers supplying the primary power to the building or facility.

2. The test load shall be that load that is served by the Emergency Power Supply System (EPSS).

3. The time delay on start shall be observed and recorded.

4. The cranking time until the prime mover starts and runs shall be observed and recorded.

5. The time taken to reach operating speed shall be observed and recorded.

6. The voltage and frequency overshoot shall be recorded.

7. The time delay on transfer to emergency power for each switch shall be recorded. Life safety and critical branch transfer switches must transfer within 10 seconds.

8. The time taken to achieve a steady-state condition with all switches transferred to the emergency position shall be observed and recorded.

9. The voltage, frequency, and amperes shall be recorded.

10. The prime mover oil pressure and water temperature shall be recorded, where applicable.

11. The battery charge rate shall be recorded at 5-minute intervals for the first 15 minutes and at 15 minute intervals thereafter.

12. A load shall be applied for a 4-hour, full load resistive test. If the generator set has not been provided with a .8 power factor standard factory test, a reactive load bank shall be required. The building load shall be permitted to serve as part or all of the load, supplemented by a load bank of sufficient size to provide a load equal to 100 percent of the nameplate rating of the Emergency Power Supply (EPS), less applicable derating factors for site conditions.

13. When primary power is returned to the building or facility, the time delay on retransfer to primary for each switch with a minimum setting of 5 minutes shall be recorded.

14. The time delay on the prime mover cool down period and shutdown shall be recorded.

15. Allow prime mover to cool for 5 minutes.

16. The load test with building load, or other loads that simulate the intended load, shall be continued for 2 hours, observing and recording load changes and the resultant effect on voltage and frequency

17. The full load test shall be initiated immediately after the cooling time has expired by any method that starts the prime mover and, immediately upon reaching rated rpm, picks up 100 percent of the nameplate kW rating on one step, less applicable derating factors for site conditions.

18. During test, record the following at 5-minute intervals for the first 15 minutes and every 15 minutes for the rest of the test:

    a. Kilowatts
    b. Amperes
    c. Voltage
    d. Frequency
    e. Coolant temperature
    f. Enclosure temperature (interior)
    g. Oil pressure
    h. Engine exhaust temperature
    i. Engine inlet temperature
    j. Oil Temperature
    k. Battery charge rate

19. Upon completion of the test and after a cool down period, the crank/rest cycle shall be tested.

    a. Any method recommended by the manufacturer for the cycle crank test shall be utilized to prevent the prime mover from running.
    b. The control switch shall be set at “run” to cause the prime mover to crank.

c. The complete crank/rest cycle shall be observed and recorded.

20. Test alarm and shutdown circuits as typically performed by the generator supplier.

E. Installing contractor shall fill fuel tanks upon completion of test. This is waived if the system is filled/supplied by an on-site fuel source.

F. Testing documentation shall be submitted to the Engineer for review and approval.

3.4 MANUFACTURER'S FIELD SERVICES

A. Prepare, start, test, and adjust systems under provisions of Section 16010.

3.5 ADJUSTING

A. Adjust generator output voltage and engine speed.

3.6 CLEANING

A. Clean work under provisions of Section 16010.

B. Clean engine and generator surfaces.

3.7 DEMONSTRATION

A. Provide systems demonstration. Coordinate the demonstration schedule with the owner and architect/engineer.

B. Describe loads connected to emergency and standby systems and restrictions for future load additions.

C. Simulate power outage by interrupting normal source, and demonstrate that system operates to provide emergency and standby power.

3.8 TRAINING

A. The supplier of the electric generating plant and associated items covered herein shall provide factory trained field service engineer to provide a comprehensive training of site personnel for a minimum of 4 hours.

END OF SECTION 16622

SECTION 26 36 00
ENCLOSED TRANSFER SWITCHES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes transfer switches in individual enclosures.

B. Related Sections:
   1. Section 26 32 13 - Engine Generators for testing requirements.

1.2 REFERENCES

A. National Electrical Manufacturers Association:
   1. NEMA ICS 10 - Industrial Control and Systems: AC Transfer Switch Equipment.

B. International Electrical Testing Association:
   1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

C. Underwriters Laboratories Inc.:
   1. UL 1008 - Transfer Switch Equipment.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit catalog sheets showing voltage, switch size, ratings and size of switching and overcurrent protective devices, operating logic, short circuit ratings, dimensions, and enclosure details.

1.4 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.

B. Project Record Documents: Record actual locations of enclosed transfer switches.

C. Operation and Maintenance Data: Submit routine preventative maintenance and lubrication schedule. List special tools, maintenance materials, and replacement parts.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience, and with service facilities within 100 miles of Project.``

B. Supplier: Authorized distributor of specified manufacturer with minimum three years experience.

1.6 MAINTENANCE SERVICE

A. Section 01 70 00 - Execution and Closeout Requirements: Maintenance service.

PART 2 PRODUCTS

2.1 AUTOMATIC TRANSFER SWITCH

A. Manufacturers:
   1. Kohler KSS Series
   2. Asco – 7000 Series
   3. Substitutions: Not Permitted.

B. Product Description: NEMA ICS 10, Open Transition Automatic Transfer Switch.

C. Warranty : Standard 1 Year

D. Configuration: Electrically operated, mechanically held transfer switch.
   1. Manual operation under no load.
   2. Status indicators.

E. Rating: State voltage and current rating and number of poles or "as indicated on drawings".

F. Withstand Current Rating in RMS Symmetrical Amperes:
   1. 200 Amp: 30,000
   2. 400 Amp: 50,000

G. Service Conditions: NEMA ICS 10.
   1. Temperature: 104 degrees F.
   2. Altitude: 550 feet above sea level.

H. Product Features:
   1. Indicating Lights: Mount in cover of enclosure to indicate NORMAL SOURCE AVAILABLE, ALTERNATE SOURCE AVAILABLE, switch position.
   2. Test Switch: Mount in cover of enclosure to simulate failure of normal source.
   3. Return to Normal Switch: Mount in cover of enclosure to initiate manual transfer from alternate source to normal source.
   4. Transfer Switch Auxiliary Contacts: **1** normally open; **1** normally closed.
   5. Normal Source Monitor: Monitor each line of normal source voltage and frequency; initiate transfer when voltage drops below 85 percent or frequency varies more than 3 percent from rated nominal value.
   6. Alternate Source Monitor: Monitor alternate source voltage and frequency; inhibit transfer when voltage is below 85 percent or frequency varies more than 3 percent from rated nominal value.
   7. In-Phase Monitor: Inhibit transfer until source and load are within 15 electrical degrees. Engine speed shall be adjusted to 60.1 Hz.

I. Automatic Sequence of Operation:
   1. Time Delay To Start Alternate Source Engine Generator: 0 to 30 seconds, adjustable.
   2. Initiate Transfer Load to Alternate Source: Upon initiation by normal source monitor and permission by alternate source monitor.
   3. Time Delay Before Transfer to Alternate Power Source: 0 to 30 seconds, adjustable.
   4. Initiate Retransfer Load to Normal Source: Upon permission by normal source monitor.
   5. Time Delay Before Transfer to Normal Power: 0 to 30 seconds, adjustable; bypass time delay in event of alternate source failure.
   6. Time Delay Before Engine Shut Down: 0 to 10 minutes, adjustable, of unloaded operation.
   7. Engine Exerciser: Start engine every 30 days; run for 30 minutes before shutting down. Bypass exerciser control when normal source fails during exercising period.

J. Enclosure:
   1. Enclosure: ICS 10, Type **3R.**
   2. Hygrostatic Controlled 120 vac Anti-Condensation Heater 100-250 watts and Integral Circuit Breaker.
   3. Finish: Manufacturer's standard gray enamel.

K. Accessories: Mandatory
   1. Current Sensing Option for Amp Display
   2. 6 Programmable I/O Module Time Delay, Load Add Dry Contact Signals for Customer Use.
   3. Normal Source Integral (SPD) Surge Protective Device
      a. 200 kA SC WCR
      b. Limiting L-N .6 kV at 3kA
      c. Factory mounted in switch
   4. Remote Annunciator
      a. In Normal
      b. In Emergency
      c. Normal Available
      d. Emergency Available
      e. ATS Fault
      f. Lockable Remote Test Switch

2.2 SOURCE QUALITY CONTROL

A. Furnish shop inspection and testing of each transfer switch.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install housekeeping pads in accordance with Section 03 30 00.

B. Install engraved plastic nameplates in accordance with Section 26 05 53.

3.2 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements, 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

B. Inspect and test in accordance with Factory Recommendations.

3.3 MANUFACTURER'S FIELD SERVICES

A. Section 01 40 00 - Quality Requirements: Manufacturers' field services.

B. Check out transfer switch connections and operations and place in service.

3.4 ADJUSTING

A. Section 01 70 00 - Execution and Closeout Requirements: Testing, adjusting, and balancing.

B. Adjust control and sensing devices to achieve specified sequence of operation.

3.5 DEMONSTRATION AND TRAINING

A. Demonstrate operation of transfer switch in bypass, normal, and emergency modes.

END OF SECTION

SECTION 260505
SELECTIVE DEMOLITION FOR ELECTRICAL

PART 3 EXECUTION

1.01 EXAMINATION

A. Verify that abandoned wiring and equipment serve only abandoned facilities.

B. Beginning of demolition means installer accepts existing conditions.

1.02 PREPARATION

A. Disconnect electrical systems in parking lots, walls, floors, and ceilings to be removed.

B. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

1.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Remove, relocate, and extend existing installations to accommodate new construction.

B. Remove abandoned wiring to source of supply if not useable for new work.

C. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

D. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.

E. Disconnect and remove abandoned panelboards and distribution equipment.

F. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.

G. Repair adjacent construction and finishes damaged during demolition and extension work.

H. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.

I. Extend existing installations using materials and methods similar to existing construction methods.

1.04 CLEANING AND REPAIR

A. Clean and repair existing materials and equipment that remain or that are to be reused.

B. Luminaires: Remove existing luminaires for cleaning. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry. Replace lamps, ballasts and broken electrical parts.

END OF SECTION

SECTION 26 0519
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Single conductor building wire.
B. Service entrance cable.
C. Metal-clad cable.
D. Wiring connectors.
E. Electrical tape.
F. Heat shrink tubing.
G. Wire pulling lubricant.

1.02 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2018).
B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011 (Reapproved 2017).
C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010 (Reapproved 2014).
D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2014).
E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2017.
F. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2013.
G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
H. NECA 120 - Standard for Installing Armored Cable (AC) and Metal-Clad Cable (MC); 2012.
I. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2009.
J. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.
K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
L. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.
M. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.
N. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.
O. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.
P. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.
Q. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.
R. UL 854 - Service-Entrance Cables; Current Edition, Including All Revisions.
S. UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.04 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.06 FIELD CONDITIONS

A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F, unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

C. Metal-clad cable is permitted only as follows:
   1. Where not otherwise restricted, may be used:
      a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
         1) Maximum Length: 6 feet.
      b. Where concealed in hollow stud walls and above accessible ceilings for branch circuits up to 20 A.
         1) Exception: Provide single conductor building wire in raceway for circuit homerun from first outlet to panelboard.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

D. Comply with NEMA WC 70.

E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

G. Conductor Material:
   1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
   2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
   3. Tinned Copper Conductors: Comply with ASTM B33.

H. Minimum Conductor Size:

1. Branch Circuits: 12 AWG.
    a. Exceptions:
        1) 20 A, 120 V circuits longer than 75 feet: 10 AWG, for voltage drop.
        2) 20 A, 120 V circuits longer than 150 feet: 8 AWG, for voltage drop.

I. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

J. Conductor Color Coding:
1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
2. Color Coding Method: Integrally colored insulation.
3. Color Code:
    a. 208Y/120 V, 3 Phase, 4 Wire System:
        1) Phase A: Black.
        2) Phase B: Red.
        3) Phase C: Blue.
        4) Neutral/Grounded: White.
    b. Equipment Ground, All Systems: Green.

2.03 SINGLE CONDUCTOR BUILDING WIRE

A. Manufacturers:
1. Copper Building Wire:
    a. Cerro Wire LLC: www.cerrowire.com/#sle.
    b. Encore Wire Corporation: www.encorewire.com/#sle.
    c. General Cable Technologies Corporation: www.generalcable.com/#sle.
    d. Southwire Company: www.southwire.com/#sle.

B. Description: Single conductor insulated wire.

C. Conductor Stranding:
1. Feeders and Branch Circuits:
    a. Size 10 AWG and Smaller: Solid.
    b. Size 8 AWG and Larger: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation:
1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2.

2.04 SERVICE ENTRANCE CABLE

A. Manufacturers:
1. Copper Service Entrance Cable:
    a. Cerro Wire LLC: www.cerrowire.com/#sle.
    b. Encore Wire Corporation: www.encorewire.com/#sle.
    c. Southwire Company: www.southwire.com/#sle.

B. Service Entrance Cable for Underground Use: NFPA 70, Type USE single-conductor cable listed and labeled as complying with UL 854, Type USE-2, and with UL 44, Type RHH/RHW-2.

C. Conductor Stranding: Stranded.

D. Insulation Voltage Rating: 600 V.

2.05 METAL-CLAD CABLE

A. Manufacturers:
1. AFC Cable Systems Inc: www.afcweb.com/#sle.
2. Encore Wire Corporation: www.encorewire.com/#sle.
3. Southwire Company: www.southwire.com/#sle.

B. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.

C. Conductor Stranding:
   1. Size 10 AWG and Smaller: Solid.
   2. Size 8 AWG and Larger: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.

F. Grounding: Full-size integral equipment grounding conductor.

G. Armor: Steel, interlocked tape.

2.06 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

2.07 ACCESSORIES

A. Electrical Tape:
   1. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.
   2. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil; suitable for continuous temperature environment up to 194 degrees F and short-term 266 degrees F overload service.
   3. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil; suitable for continuous temperature environment up to 176 degrees F.
   4. Varnished Cambric Electrical Tape: Cotton cambric fabric tape, with or without adhesive, oil-primed and coated with high-grade insulating varnish; minimum thickness of 7 mil; suitable for continuous temperature environment up to 221 degrees F.
   5. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil.

B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.

C. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that work likely to damage wire and cable has been completed.

C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.

D. Verify that field measurements are as indicated.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.03 INSTALLATION

A. Circuiting Requirements:
   1. Unless dimensioned, circuit routing indicated is diagrammatic.
   2. When circuit destination is indicated without specific routing, determine exact routing required.

B. Install products in accordance with manufacturer's instructions.

C. Perform work in accordance with NECA 1 (general workmanship).

D. Install metal-clad cable (Type MC) in accordance with NECA 120.

E. Installation in Raceway:
   1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
   2. Pull all conductors and cables together into raceway at same time.
   3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
   4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

F. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

G. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
   1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.

H. Terminate cables using suitable fittings.
   1. Metal-Clad Cable (Type MC):
      a. Use listed fittings.
      b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.

I. Install conductors with a minimum of 12 inches of slack at each outlet.

J. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

K. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

L. Make wiring connections using specified wiring connectors.
   1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
   2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
   3. Do not remove conductor strands to facilitate insertion into connector.
   4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.

M. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
   1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
      a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
      b. For taped connections likely to require re-entering, including motor leads, first apply varnished cambric electrical tape, followed by adequate amount of rubber splicing electrical tape, followed by outer covering of vinyl insulating electrical tape.
   2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
      a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.

b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.

3. Wet Locations: Use heat shrink tubing.

N. Insulate ends of spare conductors using vinyl insulating electrical tape.

O. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

P. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

3.04 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.

C. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION 26 0519

SECTION 26 0526
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Grounding and bonding requirements.

B. Conductors for grounding and bonding.

C. Connectors for grounding and bonding.

D. Ground rod electrodes.

1.02 RELATED REQUIREMENTS

A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.

B. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2012.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2007.

D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.04 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

A. Do not use products for applications other than as permitted by NFPA 70 and product listing.

B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

D. Grounding System Resistance:
   1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.
   2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.
   3. Between Grounding Electrode System and Major Electrical Equipment Frames, System Neutral, and Derived Neutral Points: Not greater than 0.5 ohms, when tested using "point-to-point" methods.

E. Grounding Electrode System:

1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
   a. Provide continuous grounding electrode conductors without splice or joint.
   b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
2. Metal Underground Water Pipe(s):
   a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet (3.0 m) at an accessible location not more than 5 feet (1.5 m) from the point of entrance to the building.
   b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.
   c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.
3. Metal In-Ground Support Structure:
   a. Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with NFPA 70.
4. Concrete-Encased Electrode:
   a. Provide connection to concrete-encased electrode consisting of not less than 20 feet (6.0 m) of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.
5. Ground Rod Electrode(s):
   a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.
   b. Space electrodes not less than 10 feet (3.0 m) from each other and any other ground electrode.
6. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.

F. Service-Supplied System Grounding:
   1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.
   2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.

G. Separately Derived System Grounding:
   1. Separately derived systems include, but are not limited to:
      a. Transformers (except autotransformers such as buck-boost transformers).
   2. Provide grounding electrode conductor to connect derived system grounded conductor to nearest effectively grounded metal building frame. Unless otherwise indicated, make connection at neutral (grounded) bus in source enclosure.
   3. Provide bonding jumper to connect derived system grounded conductor to nearest metal building frame and nearest metal water piping in the area served by the derived system, where not already used as a grounding electrode for the derived system. Make connection at same location as grounding electrode conductor connection.
   4. Provide system bonding jumper to connect system grounded conductor to equipment ground bus. Make connection at same location as grounding electrode conductor connection. Do not make any other connections between neutral (grounded) conductors and ground on load side of separately derived system disconnect.
   5. Where the source and first disconnecting means are in separate enclosures, provide supply-side bonding jumper between source and first disconnecting means.

2.02 GROUNDING AND BONDING COMPONENTS

A. General Requirements:
   1. Provide products listed, classified, and labeled as suitable for the purpose intended.
   2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 0526:
   1. Use insulated copper conductors unless otherwise indicated.
      a. Exceptions:
         1) Use bare copper conductors where installed underground in direct contact with earth.
         2) Use bare copper conductors where directly encased in concrete (not in raceway).

C. Connectors for Grounding and Bonding:
   1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
   2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
   3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.

D. Ground Rod Electrodes:
   1. Comply with NEMA GR 1.
   2. Material: Copper-bonded (copper-clad) steel.
   3. Size: 3/4 inch (19 mm) diameter by 10 feet (3.0 m) length, unless otherwise indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that work likely to damage grounding and bonding system components has been completed.

B. Verify that field measurements are as indicated.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.
   1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches (150 mm) below finished grade.

D. Make grounding and bonding connections using specified connectors.
   1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
   2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
   3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
   4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
   5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

E. Identify grounding and bonding system components in accordance with Section 26 0553.

3.03 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.13.

C. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.

D. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

END OF SECTION 26 0526

SECTION 26 0529
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.02 RELATED REQUIREMENTS

A. Section 26 0533.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.

B. Section 26 0533.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.

C. Section 26 5100 - Interior Lighting: Additional support and attachment requirements for interior luminaires.

D. Section 26 5600 - Exterior Lighting: Additional support and attachment requirements for exterior luminaires.

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2015.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Comply with applicable building code.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
   2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
   3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
   4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
   5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
      a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.

b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.
1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
2. Conduit Clamps: Bolted type unless otherwise indicated.

C. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.

D. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.

E. Anchors and Fasteners:
1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. Equipment Support and Attachment:
1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

H. Conduit Support and Attachment: Also comply with Section 26 0533.13.

I. Box Support and Attachment: Also comply with Section 26 0533.16.

J. Interior Luminaire Support and Attachment: Also comply with Section 26 5100.

K. Exterior Luminaire Support and Attachment: Also comply with Section 26 5600.

L. Secure fasteners according to manufacturer's recommended torque settings.

M. Remove temporary supports.

3.03 FIELD QUALITY CONTROL

A. Inspect support and attachment components for damage and defects.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION 26 0529

SECTION 26 0533.13

CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flexible metal conduit (FMC).

B. Liquid tight flexible metal conduit (LFMC).

C. Electrical metallic tubing (EMT).

D. Rigid polyvinyl chloride (PVC) conduit.

E. Conduit fittings.

F. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 26 0526 - Grounding and Bonding for Electrical Systems.

B. Section 26 0529 - Hangers and Supports for Electrical Systems.

1.03 REFERENCE STANDARDS

A. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2015.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2003.

D. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

E. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit; 2018.

G. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2013.

H. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2016.

I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.

K. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.

L. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.

M. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

N. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

1.04 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the

most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.

C. Underground:
   1. Under Slab on Grade: Use rigid PVC conduit.

D. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

E. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

F. Exposed, Exterior: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or PVC-coated galvanized steel rigid metal conduit.

G. Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit.
   1. Maximum Length: 6 feet.

2.02 CONDUIT REQUIREMENTS

A. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Minimum Conduit Size, Unless Otherwise Indicated:
   1. Branch Circuits: 1/2 inch (16 mm) trade size.
   2. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.
   3. Control Circuits: 1/2 inch (16 mm) trade size.
   4. Flexible Connections to Luminaires: 3/8 inch (12 mm) trade size.
   5. Underground, Interior: 3/4 inch (21 mm) trade size.
   6. Underground, Exterior: 1 inch (27 mm) trade size.

D. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

B. Fittings:
   1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.
   3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.04 INTERMEDIATE METAL CONDUIT (IMC)

A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

B. Fittings:
   1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.
   3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.05 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.

B. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil.

C. PVC-Coated Fittings:

1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.
2. Non-Hazardous Locations: Use fittings listed and labeled as complying with UL 514B.
3. Material: Use steel or malleable iron.
4. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil.

D. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil.

2.06 FLEXIBLE METAL CONDUIT (FMC)

A. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.

B. Fittings:
1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.

2.07 ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

B. Fittings:
1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.
3. Connectors and Couplings: Use compression (gland) or set-screw type.
a. Do not use indenter type connectors and couplings.

2.08 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

B. Fittings:
1. Manufacturer: Same as manufacturer of conduit to be connected.
2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive conduits.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.

D. Install intermediate metal conduit (IMC) in accordance with NECA 101.

E. Install PVC-coated galvanized steel rigid metal conduit (RMC) using only tools approved by the manufacturer.

F. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.

G. Conduit Routing:
1. Unless dimensioned, conduit routing indicated is diagrammatic.

2. When conduit destination is indicated without specific routing, determine exact routing required.
3. Conceal all conduits unless specifically indicated to be exposed.
4. Conduits in the following areas may be exposed, unless otherwise indicated:
   a. Electrical rooms.
   b. Mechanical equipment rooms.
   c. Within joists in areas with no ceiling.

H. Conduit Support:
1. Secure and support conduits in accordance with NFPA 70 and Section 26 0529 using suitable supports and methods approved by the authority having jurisdiction.
2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.

I. Connections and Terminations:
1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
3. Use suitable adapters where required to transition from one type of conduit to another.
4. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
5. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
6. Secure joints and connections to provide maximum mechanical strength and electrical continuity.

J. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
4. Conceal bends for conduit risers emerging above ground.
5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
8. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

K. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
3. Where conduits are subject to earth movement by settlement or frost.

L. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an

accessible point near the penetration to prevent condensation. This includes, but is not limited to:

1. Where conduits pass from outdoors into conditioned interior spaces.
2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

M. Provide grounding and bonding in accordance with Section 26 0526.

3.03 FIELD QUALITY CONTROL

A. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

B. Where coating of PVC-coated galvanized steel rigid metal conduit (RMC) contains cuts or abrasions, repair in accordance with manufacturer's instructions.

C. Correct deficiencies and replace damaged or defective conduits.

3.04 CLEANING

A. Clean interior of conduits to remove moisture and foreign matter.

3.05 PROTECTION

A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION 26 0533.13

SECTION 26 0533.16

BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.

B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.

C. Floor boxes.

1.02 RELATED REQUIREMENTS

A. Section 26 0529 - Hangers and Supports for Electrical Systems.

B. Section 26 2726 - Wiring Devices:
   1. Wall plates.
   2. Floor box service fittings.
   3. Access floor boxes.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.

C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013.

E. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports; 2013.

F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2018.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

J. UL 508A - Industrial Control Panels; 2013.

K. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

L. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
   4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
   5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
   6. Coordinate the work with other trades to preserve insulation integrity.

7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
8. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 BOXES

A. General Requirements:
   1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
   2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
   3. Provide products listed, classified, and labeled as suitable for the purpose intended.
   4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
   5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
   1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
   2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
   3. Use nonmetallic boxes where exposed rigid PVC conduit is used.
   4. Use suitable concrete type boxes where flush-mounted in concrete.
   5. Use suitable masonry type boxes where flush-mounted in masonry walls.
   6. Use raised covers suitable for the type of wall construction and device configuration where required.
   7. Use shallow boxes where required by the type of wall construction.
   8. Do not use "through-wall" boxes designed for access from both sides of wall.
   9. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
   10. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
   11. Nonmetallic Boxes: Comply with NEMA OS 2, and list and label as complying with UL 514C.
   12. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
   13. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
   14. Minimum Box Size, Unless Otherwise Indicated:
       a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size.
       b. Communications Systems Outlets: 4 inch square by 2-1/8 inch (100 by 54 mm) trade size.
       c. Ceiling Outlets: 4 inch octagonal or square by 1-1/2 inch deep (100 by 38 mm) trade size.
   15. Wall Plates: Comply with Section 26 2726.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:
   1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
   2. NEMA 250 Environment Type, Unless Otherwise Indicated:
   3. Junction and Pull Boxes Larger Than 100 cubic inches:
      a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive boxes.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Box Supports:
   1. Secure and support boxes in accordance with NFPA 70 and Section 26 0529 using suitable supports and methods approved by the authority having jurisdiction.
   2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
   3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
   4. Use far-side support to secure flush-mounted boxes supported from single stud in hollow stud walls. Repair or replace supports for boxes that permit excessive movement.

E. Install boxes plumb and level.

F. Flush-Mounted Boxes:
   1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.
   2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
   3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.

G. Install boxes as required to preserve insulation integrity.

H. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

I. Close unused box openings.

J. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

K. Provide grounding and bonding in accordance with Section 26 0526.

3.03 CLEANING

A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.04 PROTECTION

A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION 26 0533.16

SECTION 26 0553
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical identification requirements.

B. Identification nameplates and labels.

C. Underground warning tape.

1.02 RELATED REQUIREMENTS

A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

1.03 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.05 FIELD CONDITIONS

A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

A. Identification for Equipment:
   1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
      a. Panelboards:
         1) Identify power source and circuit number. Include location when not within sight of equipment.
         2) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
      b. Enclosed switches, circuit breakers, and motor controllers:
      c. Time Switches:
         1) Identify load(s) served and associated circuits controlled. Include location.

B. Identification for Conductors and Cables:
   1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 0519.
   2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:
   1. Materials:
      a. Indoor Clean, Dry Locations: Use plastic nameplates.
   2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.
   3. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.

B. Identification Labels:

1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C. Format for Equipment Identification:
1. Minimum Size: 1 inch by 2.5 inches.
2. Legend:
   a. Equipment designation or other approved description.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height:
   a. Equipment Designation: 1/2 inch.
5. Color:
   a. Normal Power System: White text on black background.

2.03 UNDERGROUND WARNING TAPE

A. Materials: Use foil-backed detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.

B. Foil-backed Detectable Type Tape: 3 inches wide, with minimum thickness of 5 mil, unless otherwise required for proper detection.

C. Legend: Type of service, continuously repeated over full length of tape.

D. Color:
1. Tape for Buried Power Lines: Black text on red background.
2. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

PART 3 EXECUTION

3.01 PREPARATION

A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
1. Surface-Mounted Equipment: Enclosure front.
2. Flush-Mounted Equipment: Inside of equipment door.
3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
4. Elevated Equipment: Legible from the floor or working platform.
5. Interior Components: Legible from the point of access.
6. Conductors and Cables: Legible from the point of access.

C. Install identification products centered, level, and parallel with lines of item being identified.

D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.

E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

F. Install underground warning tape above buried lines with one tape per trench at 3 inches below finished grade.

G. Mark all handwritten text, where permitted, to be neat and legible.

3.03 FIELD QUALITY CONTROL

A. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION 26 0553

SECTION 26 0583

WIRING CONNECTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical connections to equipment.

1.02 RELATED REQUIREMENTS

A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables.

B. Section 26 0533.13 - Conduit for Electrical Systems.

C. Section 26 2816.16 - Enclosed Switches.

1.03 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 MATERIALS

A. Disconnect Switches: As specified in Section 26 2816.16 and in individual equipment sections.

B. Flexible Conduit: As specified in Section 26 0533.13.

C. Wire and Cable: As specified in Section 26 0519.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.02 ELECTRICAL CONNECTIONS

A. Make electrical connections in accordance with equipment manufacturer's instructions.

B. Make conduit connections to equipment using flexible conduit. Use liquid tight flexible conduit with watertight connectors in damp or wet locations.

C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.

D. Provide receptacle outlet to accommodate connection with attachment plug.

E. Provide cord and cap where field-supplied attachment plug is required.

F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.

H. Install terminal block jumpers to complete equipment wiring requirements.

I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

END OF SECTION 26 0583

SECTION 26 0923
LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Occupancy sensors.

B. Switches.

1.02 RELATED REQUIREMENTS

A. Section 26 0529 - Hangers and Supports for Electrical Systems.

B. Section 26 0533.16 - Boxes for Electrical Systems.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2018.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. UL 773A - Nonindustrial Photoelectric Switches for Lighting Control; Current Edition, Including All Revisions.

F. UL 916 - Energy Management Equipment; Current Edition, Including All Revisions.

G. UL 917 - Clock-Operated Switches; Current Edition, Including All Revisions.

H. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of lighting control devices with millwork, furniture, equipment, etc. installed under other sections or by others.
2. Coordinate the placement of wall switch occupancy sensors with actual installed door swings.
3. Coordinate the placement of occupancy sensors with millwork, furniture, equipment or other potential obstructions to motion detection coverage installed under other sections or by others.
4. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

A. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.

1. Occupancy Sensors: Include detailed motion detection coverage range diagrams.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.08 FIELD CONDITIONS

1.09 WARRANTY

A. Provide five year manufacturer warranty for all occupancy sensors.

PART 2 PRODUCTS

2.01 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.

2.02 OCCUPANCY SENSORS

A. Manufacturers:
   1. Hubbell Incorporated: www.hubbell.com/#sle.
   2. Lutron Electronics Company, Inc: www.lutron.com/#sle.
   3. WattStopper: www.wattstopper.com/#sle.

B. All Occupancy Sensors:
   1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
   2. Sensor Technology:
      a. Passive Infrared (PIR) Occupancy Sensors: Designed to detect occupancy by sensing movement of thermal energy between zones.
      b. Ultrasonic Occupancy Sensors: Designed to detect occupancy by sensing frequency shifts in emitted and reflected inaudible sound waves.
      c. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and ultrasonic technologies.
   3. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during an adjustable turn-off delay time interval.
   4. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.
   5. Passive Infrared Lens Field of View: Field customizable by addition of factory masking material, adjustment of integral blinders, or similar means to block motion detection in selected areas.
   6. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.

C. Wall Switch Occupancy Sensors:
   1. All Wall Switch Occupancy Sensors:
      a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.
      b. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.
   2. Passive Infrared/Ultrasonic Dual Technology Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 1000 SF.

D. Wall Dimmer Occupancy Sensors:
   1. General Requirements:
      a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated dimming control capability , and no leakage current to load in off mode.
      b. Dimmer: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, and listed as complying with UL 1472; type and rating suitable for load controlled.

E. Ceiling Mounted Occupancy Sensors:
   1. All Ceiling Mounted Occupancy Sensors:
      a. Description: Low profile occupancy sensors designed for ceiling installation.
   2. Passive Infrared (PIR) Ceiling Mounted Occupancy Sensors:
      a. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet at a mounting height of 10 FT, with a field of view of 360 degrees.
   3. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:
      a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.

F. Directional Occupancy Sensors:
   1. All Directional Occupancy Sensors: Designed for wall or ceiling mounting, with integral swivel for field adjustment of motion detection coverage.
   2. Passive Infrared (PIR) Directional Occupancy Sensors:
      a. Long Range Sensors: Capable of detecting motion within a distance of 80 feet at a mounting height of 10 feet.
      b. High Bay Sensors: Capable of detecting motion within a distance of 50 feet at a mounting height of 30 feet..

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.

F. Verify that the service voltage and ratings of lighting control devices are appropriate for the service voltage and load requirements at the location to be installed.

G. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of lighting control devices provided under this section.

C. Install lighting control devices in accordance with manufacturer's instructions.

D. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

E. Install lighting control devices plumb and level, and held securely in place.

F. Provide required supports in accordance with Section 26 0529.

G. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

H. Occupancy Sensor Locations:
   1. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors a minimum of 4 feet from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.

I. Unless otherwise indicated, install power packs for lighting control devices above accessible ceiling or above access panel in inaccessible ceiling near the sensor location.

J. Unless otherwise indicated, install switches on load side of power packs so that switch does not turn off power pack.

3.04 FIELD QUALITY CONTROL

A. Inspect each lighting control device for damage and defects.

B. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area.

C. Test time switches to verify proper operation.

D. Test outdoor photo controls to verify proper operation, including time delays where applicable.

E. Correct wiring deficiencies and replace damaged or defective lighting control devices.

3.05 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Architect.

C. Adjust position of directional occupancy sensors and outdoor motion sensors to achieve optimal coverage as required.

D. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.

E. Adjust time switch settings to achieve desired operation schedule as indicated or as directed by Architect.

F. Adjust external sliding shields on outdoor photo controls under optimum lighting conditions to achieve desired turn-on and turn-off activation as indicated or as directed by Architect.

3.06 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.07 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of lighting control devices to Architect, and correct deficiencies or make adjustments as directed.

B. Training: Train Owner's personnel on operation, adjustment, programming, and maintenance of lighting control devices.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Provide minimum of two hours of training.
   3. Instructor: Qualified contractor familiar with the project and with sufficient knowledge of the installed lighting control devices.
   4. Location: At project site.

END OF SECTION 26 0923

SECTION 26 2416
PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Power distribution panelboards.

B. Lighting and appliance panelboards.

C. Overcurrent protective devices for panelboards.

1.02 RELATED REQUIREMENTS

A. Section 26 0526 - Grounding and Bonding for Electrical Systems.

B. Section 26 0529 - Hangers and Supports for Electrical Systems.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NECA 407 - Standard for Installing and Maintaining Panelboards; 2015.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2018.

D. NEMA PB 1 - Panelboards; 2011.

E. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; 2013.

F. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

J. UL 67 - Panelboards; Current Edition, Including All Revisions.

K. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

L. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.07 FIELD CONDITIONS

A. Maintain ambient temperature within the following limits during and after installation of panelboards:
   1. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. ABB/GE: www.geindustrial.com/#sle.

B. Eaton Corporation: www.eaton.com/#sle.

C. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.

D. Siemens Industry, Inc: www.usa.siemens.com/#sle.

E. Source Limitations: Furnish panelboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 PANELBOARDS - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet.
   2. Ambient Temperature:
      a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

C. Short Circuit Current Rating:
   1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

D. Panelboards Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.

E. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

F. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

G. Bussing: Sized in accordance with UL 67 temperature rise requirements.
   1. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

H. Conductor Terminations: Suitable for use with the conductors to be installed.

I. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1.
   2. Boxes: Galvanized steel unless otherwise indicated.
      a. Provide wiring gutters sized to accommodate the conductors to be installed.
   3. Fronts:
      a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
   4. Lockable Doors: All locks keyed alike unless otherwise indicated.

J. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

2.03 POWER DISTRIBUTION PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:
   1. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
   2. Main and Neutral Lug Type: Mechanical.

C. Bussing:
   1. Phase and Neutral Bus Material: Copper.
   2. Ground Bus Material: Copper.

D. Circuit Breakers:
   1. Provide bolt-on type or plug-in type secured with locking mechanical restraints. Electrical contractor to verify prior to ordering new panel to ensure existing breakers can be transferred.
   2. Provide thermal magnetic circuit breakers unless otherwise indicated.

E. Enclosures:
   1. Provide recessed-mounted enclosure unless otherwise indicated.

2.04 LIGHTING AND APPLIANCE PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:
   1. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
   2. Main and Neutral Lug Type: Mechanical.

C. Bussing:
   1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
   2. Phase and Neutral Bus Material: Copper.
   3. Ground Bus Material: Copper.

D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.

E. Enclosures:
   1. Provide recessed-mounted enclosures as indicated.
   2. Provide clear plastic circuit directory holder mounted on inside of door.

2.05 OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:
   1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
   2. Interrupting Capacity:
      a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
         1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
      b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
   3. Conductor Terminations:
      a. Provide mechanical lugs unless otherwise indicated.
      b. Lug Material: Copper, suitable for terminating copper conductors only.
   4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
   5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
   6. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive panelboards.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.

D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

E. Provide required support and attachment in accordance with Section 26 0529.

F. Install panelboards plumb.

G. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.

H. Provide grounding and bonding in accordance with Section 26 0526.

I. Install all field-installed branch devices, components, and accessories.

J. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.

K. Provide filler plates to cover unused spaces in panelboards.

3.03 FIELD QUALITY CONTROL

A. Test GFCI circuit breakers to verify proper operation.

B. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of panelboard fronts.

C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

3.05 CLEANING

A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 26 2416

SECTION 26 2726

WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall switches.

B. Wall dimmers.

C. Receptacles.

D. Wall plates.

E. Floor box service fittings.

1.02 RELATED REQUIREMENTS

A. Section 26 0533.16 - Boxes for Electrical Systems.

1.03 REFERENCE STANDARDS

A. FS W-C-596 - Connector, Electrical, Power, General Specification for; 2017h.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.

D. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2015).

E. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2016.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.

H. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.

I. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

J. UL 1310 - Class 2 Power Units; Current Edition, Including All Revisions.

K. UL 1917 - Solid-State Fan Speed Controls; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.
4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
5. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

B. Sequencing:

1. Do not install wiring devices until final surface finishes and painting are complete.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

1.06 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

PART 2 PRODUCTS

2.01 WIRING DEVICE APPLICATIONS

A. Provide wiring devices suitable for intended use and with ratings adequate for load served.

B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.

C. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.

D. Provide tamper resistant receptacles for receptacles installed in dwelling units or as called for in the plans.

E. Provide GFCI protection for receptacles installed within 6 feet of sinks.

F. Provide GFCI protection for receptacles installed in kitchens.

G. Provide GFCI protection for receptacles serving electric drinking fountains.

H. For flush floor service fittings, use tile rings for installations in tile floors.

I. For flush floor service fittings, use carpet flanges for installations in carpeted floors.

2.02 WIRING DEVICE FINISHES

A. Provide wiring device finishes as described below unless otherwise indicated.

B. Wiring Devices, Unless Otherwise Indicated: White with stainless steel wall plate.

C. Flush Floor Box Service Fittings: Gray wiring devices with brass cover and ring/flange.

2.03 WALL SWITCHES

A. Manufacturers:
   1. Hubbell Incorporated: www.hubbell.com/#sle.
   2. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.
   3. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.

B. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

2.04 RECEPTACLES

A. Manufacturers:
   1. Hubbell Incorporated: www.hubbell.com/#sle.
   2. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.
   3. Lutron Electronics Company, Inc; Designer Style: www.lutron.com/#sle.
   4. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.

B. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
   1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
   2. NEMA configurations specified are according to NEMA WD 6.

C. Convenience Receptacles:
   1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
   2. Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
   3. Tamper Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; single or duplex as indicated on the drawings.

D. GFCI Receptacles:
   1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
   2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
   3. Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.
   4. Tamper Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type.

E. USB Charging Devices:
   1. USB Charging Devices - General Requirements: Listed as complying with UL 1310.
      a. Charging Capacity - Two-Port Devices: 2.1 A, minimum.
   2. USB Charging/Tamper Resistant Receptacle Combination Devices: Two-port (Type A) USB charging device and receptacle, commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; rectangular decorator style.

2.05 WALL PLATES

A. Manufacturers:
   1. Hubbell Incorporated: www.hubbell-wiring.com/#sle.
   2. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.
   3. Lutron Electronics Company, Inc: www.lutron.com/#sle.
   4. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.

B. Wall Plates: Comply with UL 514D.
   1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
   2. Size: Standard.
   3. Screws: Metal with slotted heads finished to match wall plate finish.

C. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.

D. Weatherproof Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that wall openings are neatly cut and will be completely covered by wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that floor boxes are adjusted properly.

F. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

G. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of wiring devices provided under this section.
   1. Mounting Heights: Unless otherwise indicated, as follows:
      a. Wall Switches: 48 inches above finished floor.
      b. Wall Dimmers: 48 inches above finished floor.
      c. Fan Speed Controllers: 48 inches above finished floor.
      d. Receptacles: 18 inches above finished floor or 6 inches above counter.

C. Install wiring devices in accordance with manufacturer's instructions.

D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

E. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.

F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.

G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

H. Install wiring devices plumb and level with mounting yoke held rigidly in place.

I. Install wall switches with OFF position down.

J. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.

K. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

L. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

3.04 FIELD QUALITY CONTROL

A. Inspect each wiring device for damage and defects.

B. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.

C. Test each receptacle to verify operation and proper polarity.

D. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.

E. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.05 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

B. Adjust presets for wall dimmers according to manufacturer's instructions as directed by Owner.

3.06 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION 26 2726

SECTION 26 2816.16
ENCLOSED SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Enclosed safety switches.

1.02 RELATED REQUIREMENTS

A. Section 26 0526 - Grounding and Bonding for Electrical Systems.

B. Section 26 0529 - Hangers and Supports for Electrical Systems.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2018.

C. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.

D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

H. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

A. Maintain ambient temperature between -22 degrees F and 104 degrees F during and after installation of enclosed switches.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. ABB/GE: www.geindustrial.com/#sle.

B. Eaton Corporation: www.eaton.com/#sle.

C. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.

D. Siemens Industry, Inc: www.usa.siemens.com/#sle.

2.02 ENCLOSED SAFETY SWITCHES

A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet.
   2. Ambient Temperature: Between -22 degrees F and 104 degrees F.

D. Horsepower Rating: Suitable for connected load.

E. Voltage Rating: Suitable for circuit voltage.

F. Short Circuit Current Rating:

G. Provide with switch blade contact position that is visible when the cover is open.

H. Conductor Terminations: Suitable for use with the conductors to be installed.

I. Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.

J. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.

K. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1.
      b. Outdoor Locations: Type 3R.

L. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

M. Heavy Duty Switches:
   1. Comply with NEMA KS 1.
   2. Conductor Terminations:
      a. Lug Material: Copper, suitable for terminating copper conductors only.
   3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive enclosed safety switches.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment in accordance with Section 26 0529.

E. Install enclosed switches plumb.

F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.

G. Provide grounding and bonding in accordance with Section 26 0526.

3.03 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.

C. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 26 2816.16

SECTION 26 5100

INTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior luminaires.

B. Emergency lighting units.

C. Exit signs.

1.02 RELATED REQUIREMENTS

A. Section 26 0529 - Hangers and Supports for Electrical Systems.

B. Section 26 0533.16 - Boxes for Electrical Systems.

C. Section 26 0923 - Lighting Control Devices: Automatic controls for lighting including occupancy sensors, outdoor motion sensors, time switches, outdoor photo controls, and daylighting controls.

1.03 REFERENCE STANDARDS

A. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products; 2008.

B. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules; 2015, with Errata (2017).

C. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; 2006.

D. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.

E. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2012.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.

I. UL 1598 - Luminaires; Current Edition, Including All Revisions.

J. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
4. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and

ceiling compatibility; include model number nomenclature clearly marked with all proposed features.

1. LED Luminaires:
    a. Include estimated useful life, calculated based on IES LM-80 test data.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

A. Provide five year manufacturer warranty for LED luminaires, including drivers.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

2.02 LUMINAIRES

A. Manufacturers:
    1. Acuity Brands, Inc: www.acuitybrands.com/#sle.
    2. Cooper Lighting, a division of Cooper Industries: www.cooperindustries.com/#sle.
    3. Hubbell Lighting, Inc: www.hubbelllighting.com/#sle.
    4. Philips Lighting North America Corporation: www.lightingproducts.philips.com/#sle.
    5. Schaeffer Marketing Brands – Mobern, Cree, Liton, Eiko, & Nicor: www.smgrep.com/lighting-products/

B. Provide products that comply with requirements of NFPA 70.

C. Provide products that are listed and labeled as complying with UL 1598, where applicable.

D. Provide products listed, classified, and labeled as suitable for the purpose intended.

E. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

F. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

G. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

H. Recessed Luminaires:
    1. Ceiling Compatibility: Comply with NEMA LE 4.
    2. Luminaires Recessed in Sloped Ceilings: Provide suitable sloped ceiling adapters.

I. LED Luminaires:
    1. Components: UL 8750 recognized or listed as applicable.
    2. Tested in accordance with IES LM-79 and IES LM-80.
    3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

2.03 EMERGENCY LIGHTING UNITS

A. Manufacturers:
   1. Acuity Brands, Inc: www.acuitybrands.com/#sle.
   2. Cooper Lighting, a division of Cooper Industries: www.cooperindustries.com/#sle.
   3. Hubbell Lighting, Inc: www.hubbelllighting.com/#sle.
   4. ABB, www.new.abb.com
   5. Chloride by Signify, www.signify.com

B. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.

C. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.

D. Battery:
   1. Size battery to supply all connected lamps, including emergency remote heads where indicated.

E. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.

F. Provide low-voltage disconnect to prevent battery damage from deep discharge.

2.04 EXIT SIGNS

A. Manufacturers - Powered and Self-Luminous Signs:
   1. Acuity Brands, Inc: www.acuitybrands.com/#sle.
   2. Cooper Lighting, a division of Cooper Industries: www.cooperindustries.com/#sle.
   3. Hubbell Lighting, Inc: www.hubbelllighting.com/#sle.
   4. Philips Lighting North America Corporation; www.lightingproducts.philips.com/#sle.

B. Description: Internally illuminated exit signs with LEDs unless otherwise indicated; complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
   1. Number of Faces: Single or double as indicated or as required for the installed location.
   2. Directional Arrows: As indicated or as required for the installed location.

C. Self-Powered Exit Signs:
   1. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
   2. Battery: Sealed maintenance-free nickel cadmium unless otherwise indicated.
   3. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
   4. Provide low-voltage disconnect to prevent battery damage from deep discharge.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).

D. Provide required support and attachment in accordance with Section 26 0529.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Install accessories furnished with each luminaire.

G. Bond products and metal accessories to branch circuit equipment grounding conductor.

H. Emergency Lighting Units:
   1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

I. Exit Signs:
   1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

J. Install lamps in each luminaire.

3.04 FIELD QUALITY CONTROL

A. Inspect each product for damage and defects.

B. Operate each luminaire after installation and connection to verify proper operation.

C. Test self-powered exit signs, emergency lighting units, and fluorescent emergency power supply units to verify proper operation upon loss of normal power supply.

D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.05 CLEANING

A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.06 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of luminaires to engineer, and correct deficiencies or make adjustments as directed.

3.07 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION 26 5100

SECTION 26 5600
EXTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior luminaires.

B. Poles and accessories.

1.02 RELATED REQUIREMENTS

A. Section 26 0529 - Hangers and Supports for Electrical Systems.

B. Section 26 0533.16 - Boxes for Electrical Systems.

C. Section 26 5100 - Interior Lighting.

1.03 REFERENCE STANDARDS

A. AASHTO LTS - Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signal; 2013 (Revised 2019).

B. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products; 2008.

C. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules; 2015, with Errata (2017).

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

E. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2006.

F. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2012.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 1598 - Luminaires; Current Edition, Including All Revisions.

I. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.
2. Notify Engineer of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.

1. LED Luminaires:
   a. Include estimated useful life, calculated based on IES LM-80 test data.
2. Poles: Include information on maximum supported effective projected area (EPA) and weight for the design wind speed.

B. Certificates for Poles and Accessories: Manufacturer's documentation that products are suitable for the luminaires to be installed and comply with designated structural design criteria.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.08 WARRANTY

A. Provide five year manufacturer warranty for all LED luminaires, including drivers.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

2.02 LUMINAIRES

A. Manufacturers:
   1. Acuity Brands, Inc: www.acuitybrands.com/#sle.
   2. Cooper Lighting, a division of Cooper Industries: www.cooperindustries.com/#sle.
   3. Hubbell Lighting, Inc: www.hubbelllighting.com/#sle.
   4. Philips Lighting North America Corporation; www.lightingproducts.philips.com/#sle.
   5. Schaeffer Marketing Brands: Cree Lighting

B. Provide products that comply with requirements of NFPA 70.

C. Provide products that are listed and labeled as complying with UL 1598, where applicable.

D. Provide products listed, classified, and labeled as suitable for the purpose intended.

E. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

F. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.

G. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

H. Provide luminaires listed and labeled as suitable for wet locations unless otherwise indicated.

I. Recessed Luminaires:
   1. Ceiling Compatibility: Comply with NEMA LE 4.
   2. Luminaires Recessed in Sloped Ceilings: Provide suitable sloped ceiling adapters.

J. LED Luminaires:
   1. Components: UL 8750 recognized or listed as applicable.
   2. Tested in accordance with IES LM-79 and IES LM-80.
   3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

K. Exposed Hardware: Stainless steel.

2.03 POLES

A. Manufacturers:
   1. Acuity Brands, Inc: www.acuitybrands.com/#sle.
   2. Cooper Lighting, a division of Cooper Industries: www.cooperindustries.com/#sle.
   3. Hubbell Lighting, Inc: www.hubbelllighting.com/#sle.
   4. Philips Lighting North America Corporation; www.lightingproducts.philips.com/#sle.

B. All Poles:
   1. Provide poles and associated support components suitable for the luminaire(s) and associated supports and accessories to be installed.

2. Structural Design Criteria:
   a. Comply with AASHTO LTS.
   b. Wind Load: Include effective projected area (EPA) of luminaire(s) and associated supports and accessories to be installed.
      1) Design Wind Speed: 90 miles per hour, with gust factor of 1.3.
   c. Dead Load: Include weight of proposed luminaire(s) and associated supports and accessories.
3. Material: Steel, unless otherwise indicated.
4. Shape: Square straight, unless otherwise indicated.
5. Mounting Height: As indicated on the drawings.
6. Mounting: Install on concrete foundation, height as indicated on the drawings, unless otherwise indicated.
7. Unless otherwise indicated, provide with the following features/accessories:
   a. Handhole.
   b. Anchor bolts with leveling nuts or leveling shims.
   c. Anchor base cover.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires in accordance with NECA/IESNA 501.

D. Provide required support and attachment in accordance with Section 26 0529.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

G. Install accessories furnished with each luminaire.

H. Bond products and metal accessories to branch circuit equipment grounding conductor.

I. Install lamps in each luminaire.

3.04 FIELD QUALITY CONTROL

A. Inspect each product for damage and defects.

B. Operate each luminaire after installation and connection to verify proper operation.

C. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.05 CLEANING

A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.06 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of luminaires to Engineer, and correct deficiencies or make adjustments as directed.

3.07 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION 26 5600

DIVISION 31 – EARTHWORK
SECTION 311000 – SITE CLEARING

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. Section 011000 - Summary of Work: Limitations on Contractor's use of site and premises.

B. Section 015000 - Construction Facilities and Temporary Controls: Site fences, security, protective barriers, and waste removal.

C. Section 017000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products.

D. Section 312200 - Grading: Topsoil removal.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 SITE CLEARING

A. Comply with other requirements specified in Section 017000.

B. Minimize production of dust due to clearing operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

3.02 EXISTING UTILITIES AND BUILT ELEMENTS

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Protect existing structures and other elements that are not to be removed.

3.03 VEGETATION

A. Scope: Remove trees, shrubs, brush, and stumps in areas to be covered by building structure, paving, playing fields, lawns, and planting beds.

B. Do not remove or damage vegetation beyond the limits indicated on drawings.
   1. Exception: Specific trees and vegetation indicated on drawings to be removed.

C. Install substantial, highly visible fences at least 3 feet high to prevent inadvertent damage to vegetation to remain:
   1. At vegetation removal limits.

D. In areas where vegetation must be removed but no construction will occur other than pervious paving, remove vegetation with minimum disturbance of the subsoil.

E. Vegetation Removed: Do not burn, bury, landfill, or leave on site, except as indicated.
   1. Chip, grind, crush, or shred vegetation for mulching, composting, or other purposes; preference should be given to on-site uses.
   2. Trees: Sell if marketable; if not, treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.
   3. Sod: Re-use on site if possible; otherwise sell if marketable, and if not, treat as specified for other vegetation removed.
   4. Fill holes left by removal of stumps and roots, using suitable fill material, with top surface neat in appearance and smooth enough not to constitute a hazard to pedestrians.

F. Dead Wood: Remove all dead trees (standing or down), limbs, and dry brush in work area; treat as specified for vegetation removed.

G. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to Owner.

3.04 DEBRIS

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

DIVISION 31 – EARTHWORK
SECTION 312200 - GRADING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Removal of topsoil.

B. Rough grading the site for site structures.

C. Finish grading.

1.02 RELATED REQUIREMENTS

A. Section 311000 - Site Clearing.

B. Section 312316 - Excavation.

C. Section 312316.13 - Trenching: Trenching and backfilling for utilities.

D. Section 312316.26 - Rock Removal.

E. Section 312323 - Fill: Filling and compaction.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 012200 - Unit Prices, for general requirements relating to unit prices for this work.

PART 2 PRODUCTS

2.01 MATERIALS

A. Topsoil: See Section 312323.

B. Other Fill Materials: See Section 312323.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench mark and intended elevations for the Work are as indicated.

B. Verify the absence of standing or ponding water.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Stake and flag locations of known utilities.

C. Locate, identify, and protect from damage above- and below-grade utilities to remain.

D. Notify utility company to remove and relocate utilities.

E. Provide temporary means and methods to remove all standing or ponding water from areas prior to grading.

F. Protect site features to remain, including but not limited to bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs, from damage by grading equipment and vehicular traffic.

G. Protect trees to remain by providing substantial fencing around entire tree at the outer tips of its branches; no grading is to be performed inside this line.

3.03 ROUGH GRADING

A. Remove topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.

B. Do not remove topsoil when wet.

C. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.

D. Do not remove wet subsoil, unless it is subsequently processed to obtain optimum moisture content.

E. When excavating through roots, perform work by hand and cut roots with sharp axe.

F. See Section 312323 for filling procedures.

G. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.

H. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack surface water control.

3.04 SOIL REMOVAL

A. Stockpile topsoil to be re-used on site; remove remainder from site.

B. Stockpiles: Use areas designated on site; pile depth not to exceed 8 feet; protect from erosion.

3.05 FINISH GRADING

A. Before Finish Grading:
   1. Verify building and trench backfilling have been inspected.
   2. Verify subgrade has been contoured and compacted.

B. Remove debris, roots, branches, stones, in excess of 1/2 inch in size. Remove soil contaminated with petroleum products.

C. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 3 inches.

D. Place topsoil in areas indicated.

E. Place topsoil during dry weather.

F. Remove roots, weeds, rocks, and foreign material while spreading.

G. Near plants spread topsoil manually to prevent damage.

H. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.

I. Lightly compact placed topsoil.

J. Maintain stability of topsoil during inclement weather. Replace topsoil in areas where surface water has eroded thickness below specifications.

3.06 TOLERANCES

A. Top Surface of Subgrade: Plus or minus 0.10 foot (1-3/16 inches) from required elevation.

B. Top Surface of Finish Grade: Plus or minus 0.04 foot (1/2 inch).

3.07 REPAIR AND RESTORATION

A. Existing Facilities, Utilities, and Site Features to Remain: If damaged due to this work, repair or replace to original condition.

3.08 FIELD QUALITY CONTROL

A. See Section 312323 for compaction density testing. Contractor will engage a qualified testing agency if needed.

3.09 CLEANING

A. Remove unused stockpiled topsoil. Grade stockpile area to prevent standing water.

B. Leave site clean and raked, ready to receive landscaping.

END OF SECTION

DIVISION 31 – EARTHWORK
SECTION 312316 - EXCAVATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Excavating for building volume below grade, footings, slabs-on-grade, paving, site structures, and utilities within the building.

B. Trenching for utilities outside the building to utility main connections.

1.02 RELATED REQUIREMENTS

A. Document Geotechnical Report when available: Geotechnical report; bore hole locations and findings of subsurface materials.

B. Section 311000 - Site Clearing: Vegetation and existing debris removal.

C. Section 312200 - Grading: Grading.

D. Section 312316.13 - Trenching: Excavating for utility trenches outside the building to utility main connections.

E. Section 312316.26 - Rock Removal: Removal of rock during excavating.

F. Section 312323 - Fill: Fill materials, backfilling, and compacting.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 012200 - Unit Prices, for general requirements applicable to unit prices for excavation.

B. See Section 312323 for measurement and payment provisions related to fill.

C. See Section 312316.26 for measurement and payment provisions related to rock removal.

PART 2 PRODUCTS

2.01 MATERIALS

A. Bedding and Fill to Correct Over-Excavation:
   1. See Section 312323 for bedding and corrective fill materials at general excavations.
   2. See Section 312316.13 for bedding and corrective fill materials at utility trenches.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench mark and intended elevations for the work are as indicated.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. See Section 311000 for clearing, grubbing, and removal of existing debris.

C. See Section 312200 for topsoil removal.

D. Locate, identify, and protect utilities that remain and protect from damage.

E. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

F. Protect plants, lawns, rock outcroppings, and other features to remain.

G. Grade top perimeter of excavation to prevent surface water from draining into excavation. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by Engineer.

3.03 EXCAVATING

A. Excavate to accommodate construction operations.
   1. Excavate to the specified elevations.
   2. Excavate to the length and width required to safely install, adjust, and remove any forms, bracing, or supports necessary for the installation of the work.
   3. Cut utility trenches wide enough to allow inspection of installed utilities.
   4. See Section 312316.26 for required excavation clearances for pipes in utility trenches.
   5. Hand trim excavations. Remove loose matter.

B. Notify Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

C. Do not interfere with 45 degree bearing splay of foundations.

D. Provide temporary means and methods, as required, to remove all water from excavations until directed by Engineer. Remove and replace soils deemed suitable by classification and which are excessively moist due to lack of dewatering or surface water control.

3.04 SUBGRADE PREPARATION

A. See Section 312323 for subgrade preparation at general excavations.

B. See Section 312316.13 for subgrade preparation at utility trenches.

3.05 FILLING AND BACKFILLING

A. Do not fill or backfill until all debris, water, unsatisfactory soil materials, obstructions, and deleterious materials have been removed from excavation.

B. See Section 312323 for fill, backfill, and compaction requirements at general excavations.

C. See Section 312316.13 for fill, backfill, and compaction requirements at utility trenches.

D. See Section 312200 for rough and final grading and topsoil replacement requirements.

3.06 REPAIR

A. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 312323.

3.07 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for general requirements for field inspection and testing.

B. Provide for visual inspection of load-bearing excavated surfaces by Engineer before placement of foundations. Owner will engage a qualified testing agency if needed.

3.08 CLEANING

A. Stockpile excavated material to be re-used in area designated on site in accordance with Section 312200.

B. Remove excavated material that is unsuitable for re-use from site.

C. Remove excess excavated material from site.

3.09 PROTECTION

A. Divert surface flow from rains or water discharges from the excavation.

B. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.

C. Protect open excavations from rainfall, runoff, freezing groundwater, or excessive drying so as to maintain foundation subgrade in satisfactory, undisturbed condition.

D. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

E. Keep excavations free of standing water and completely free of water during concrete placement.

END OF SECTION

DIVISION 31 – EARTHWORK
SECTION 312323 – FILL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Filling, backfilling, and compacting for paving.

B. Backfilling and compacting for utilities outside the building to utility main connections.

C. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

1.02 RELATED REQUIREMENTS

A. Document Geotechnical Report when available: Geotechnical report; bore hole locations and findings of subsurface materials.

B. Section 312200 - Grading: Site grading.

C. Section 312316.13 - Trenching: Excavating for utility trenches outside the building to utility main connections.

D. Section 312316.26 - Rock Removal: Removal of rock during excavating.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 012200 - Unit Prices, for general requirements applicable to unit prices for earthwork.

1.04 DEFINITIONS

A. Finish Grade Elevations: Indicated on drawings.

1.05 REFERENCE STANDARDS

A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18 in.) Drop; 2017.

B. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012, with Editorial Revision (2015).

C. ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method; 2015, with Editorial Revision (2016).

D. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2012, with Editorial Revision (2015).

E. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2015.

F. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2017.

1.06 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data for Manufactured Fill.

C. Materials Sources: Submit name of imported materials source.

D. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used, including manufactured fill.

E. Compaction Density Test Reports.

1.07 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

B. When fill materials need to be stored on site, locate stockpiles where designated.
   1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
   2. Prevent contamination.
   3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. General Fill - Fill Type Granular: Conforming to State of Missouri Highway Department standard.

B. Topsoil: See Section 312200.

2.02 SOURCE QUALITY CONTROL

A. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.

B. If tests indicate materials do not meet specified requirements, change material and retest.

PART 3 EXECUTION

3.01 EXAMINATION

A. Identify required lines, levels, contours, and datum locations.

B. Verify areas to be filled are not compromised with surface or ground water.

3.02 PREPARATION

A. Scarify and proof roll subgrade surface to a depth of 6 inches to identify soft spots.

B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.

C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.03 FILLING

A. Fill to contours and elevations indicated using unfrozen materials.

B. Fill up to subgrade elevations unless otherwise indicated.

C. Employ a placement method that does not disturb or damage other work.

D. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

E. Maintain optimum moisture content of fill materials to attain required compaction density.

F. Granular Fill: Place and compact materials in equal continuous layers not exceeding 6 inches compacted depth.

G. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches compacted depth.

H. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

I. Correct areas that are over-excavated.
   1. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.

J. Compaction Density Unless Otherwise Specified or Indicated:
   1. Under paving: 95 percent of maximum dry density.

K. Reshape and re-compact fills subjected to vehicular traffic.

L. Maintain temporary means and methods, as required, to remove all water while fill is being placed as required, or until directed by the Engineer. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

3.04 FILL AT SPECIFIC LOCATIONS

A. At Lawn Areas:
   1. Use general fill.
   2. Fill up to 6 inches below finish grade elevations.
   3. Fill up to subgrade elevations.
   4. Compact to 95 percent of maximum dry density.
   5. See Section 312200 for topsoil placement.

3.05 TOLERANCES

A. Top Surface of General Filling: Plus or minus 1 inch from required elevations.

B. Top Surface of Filling Under Paved Areas: Plus or minus 1 inch from required elevations.

3.06 FIELD QUALITY CONTROL

A. Contractor will engage a qualified testing agency if needed for fill placement testing.

B. Perform compaction density testing on compacted fill in accordance with ASTM D1556/D1556M, ASTM D2167, or ASTM D6938.

C. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D698 ("standard Proctor"), ASTM D1557 ("modified Proctor"), or AASHTO T 180.

D. If tests indicate work does not meet specified requirements, remove work, replace and retest.

E. Frequency of Tests: __
   1. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 fee or less of trench length, but no fewer than two tests.
   2. Paved Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sqft. or less of paved area, but no less than two tests.

F. Proof roll compacted fill at surfaces that will be under paving.

3.07 CLEANING

A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

END OF SECTION

DIVISION 32 – EXTERIOR IMPROVEMENTS
SECTION 321313 – CONCRETE PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete sidewalks, integral curbs, gutters, parking areas, and driveways.

1.02 RELATED REQUIREMENTS

A. Section 079200 - Joint Sealants: Sealing joints.

B. Section 312200 - Grading: Preparation of site for paving and base and preparation of subsoil at pavement perimeter for planting.

C. Section 312323 - Fill: Compacted subbase for paving.

1.03 REFERENCE STANDARDS

A. ACI 301 - Specifications for Structural Concrete; 2016.

B. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).

C. ACI 305R - Guide to Hot Weather Concreting; 2010.

D. ACI 306R - Guide to Cold Weather Concreting; 2016.

E. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2018.

F. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2017a.

G. ASTM C150/C150M - Standard Specification for Portland Cement; 2018.

H. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2016.

I. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2011.

J. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2004, with Editorial Revision (2013).

K. ASTM D1752 - Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction; 2004a (Reapproved 2013).

1.04 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: Provide data on joint filler, admixtures, and curing compound.

PART 2 PRODUCTS

2.01 PAVING ASSEMBLIES

A. Comply with applicable requirements of ACI 301.

B. City of Jefferson Standard Concrete Mix for all parking, driveways and sidewalks.

2.02 FORM MATERIALS

A. Form Materials: Conform to ACI 301.

B. Joint Filler: Preformed; non-extruding bituminous type (ASTM D1751) or sponge rubber or cork (ASTM D1752).
   1. Thickness: 1/2 inch.

2.03 CONCRETE MATERIALS

A. Obtain cementitious materials from same source throughout.

B. Concrete Materials: Provide in accordance with Municipality of City of Jefferson City Public Works standards.

2.04 ACCESSORIES

A. Curing Compound: ASTM C309, Type 1, Class A.

B. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.
   1. Material: ASTM D1751, cellulose fiber.

2.05 CONCRETE MIX DESIGN

A. Concrete Properties:
   1. Compressive strength, when tested in accordance with ASTM C39/C39M at 28 days; 4000 psi.
   2. Fly Ash Content: Maximum 20 percent of cementitious materials by weight.
   3. Cement Content: Minimum 526 lb per cubic yard.
   4. Water-Cement Ratio: Maximum 37 percent by weight.
   5. Total Air Content: 6 percent, determined in accordance with ASTM C173/C173M.
   6. Maximum Slump: 4 inches.
   7. Maximum Aggregate Size: 3/4 nominal inch.

2.06 MIXING

A. Transit Mixers: Comply with ASTM C94/C94M.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify compacted subgrade is acceptable and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

3.02 SUBBASE

3.03 PREPARATION

A. Moisten base to minimize absorption of water from fresh concrete.

B. Coat surfaces of manhole frames with oil to prevent bond with concrete pavement.

3.04 FORMING

A. Place and secure forms to correct location, dimension, profile, and gradient.

B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

3.05 COLD AND HOT WEATHER CONCRETING

A. Follow recommendations of ACI 305R when concreting during hot weather.

B. Follow recommendations of ACI 306R when concreting during cold weather.

C. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

3.06 PLACING CONCRETE

A. Place concrete in accordance with Municipality of City of Jefferson City Public Works standards.

B. Do not place concrete when base surface is wet.

C. Place concrete using the slip form technique.

D. Ensure reinforcement, inserts, embedded parts, formed joints are not disturbed during concrete placement.

E. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.

F. Apply surface retarder to all exposed surfaces in accordance with manufacturer's instructions.

3.07 JOINTS

A. Align curb, gutter, and sidewalk joints.

B. Place 3/8 inch wide expansion joints at 20 foot intervals and to separate paving from vertical surfaces and other components and in pattern indicated.
   1. Form joints with joint filler extending from bottom of pavement to within 1/2 inch of finished surface.
   2. Secure to resist movement by wet concrete.

C. Provide scored joints as indicated on drawings.

D. Saw cut contraction joints 3/16 inch wide at an optimum time after finishing. Cut 1/3 into depth of slab.

3.08 FINISHING

A. Area Paving: Light broom, texture perpendicular to pavement direction.

B. Sidewalk Paving: Light broom, texture perpendicular to direction of travel with troweled and radiused edge 1/4 inch radius.

C. Curbs and Gutters: Light broom, texture parallel to pavement direction.

D. Place sealer on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

3.09 TOLERANCES

A. Maximum Variation of Surface Flatness: 1/4 inch in 10 ft.

B. Maximum Variation From True Position: 1/4 inch.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Contractor will engage a qualified testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include thos specified in this Article.

B. Testing Services: Testing of composite samples of frest concrete obtained according to ASTM C 172 shall be performed according to the following requirements.
   1. Testing Frequency: Obtain at least 1 composite sample for each 100 cu.yd. or 5,000 sqft. of fraction thereof of each concrete mix placed each day.
      a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
   2. Slump: ASTM C 143/C143M; one test at point of placement for each composite sample but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
   3. Air Content: ASTM C 231, pressure method; one test for each composite sample but not less than one test for each day's pour of each concrete mix.
   4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.

5. Compressive-Strength Tests: ASTM C 39/C 39M; test 1 specimen at 7 days and 2 specimens at 28 days.
   a. A compressive-strength test shall be teh average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.

C. Strength of concrete mix will be satisfactor if average of any 3 consectutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

D. Test results shall be reported in writing to the Ower, concrete manufacturer and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain State of Missouri Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7 and 28 day tests.

E. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths or other requirements have not been met, as directed by Owner.

F. Remove and replace concrete pavement wher etest results indicate that it does ot comply with specified requirements.

G. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work whith specified requirements.

3.11 PROTECTION

A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.

B. Do not permit pedestrian traffic over pavement until 75 percent design strength of concrete has been achieved.

C. Protect pavement from damage. Exclude traffic from pavement for at least 14 days after placement, unless cleared for earlier use by the Engineer. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

END OF SECTION

DIVISION 31 – EARTHWORK
SECTION 312373 – CONCRETE PAVING JOINT SEALERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Self-leveling pourable joint sealants.

C. Joint backings and accessories.

1.02 REFERENCE STANDARDS

A. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

B. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

1.03 SUBMITTALS

A. See Section 013300, Administrative Requirements, for submittal procedures.

B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.
   1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
   2. List of backing materials approved for use with the specific product.
   3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
   4. Substrates the product should not be used on.
   5. Substrates for which use of primer is required.
   6. Substrates for which laboratory adhesion and/or compatibility testing is required.
   7. Installation instructions, including precautions, limitations, and recommended backing materials and tools.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.

1.05 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a one year period after Date of Substantial Completion.

C. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal , exhibit loss of adhesion or cohesion, or do not cure. All joints must be completely sealed with no gaps (vertical or horizontal joints).

PART 2 PRODUCTS

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.03 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C1193.

C. Install bond breaker backing tape where backer rod cannot be used.

D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

E. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

F. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

G. Entire joint shall be contain sealant with no gaps to allow for water intrusion (vertical and horizontal joints).

END OF SECTION

DIVISION 32 – SITE CONSTRUCTION
SECTION 323113 – CHAIN LINK FENCE AND GATES

1. GENERAL

1.1 RELATED DOCUMENTS
A. DIVISION 01 - GENERAL REQUIREMENTS: Drawings, quality, product and performance requirements, general and supplemental conditions apply as applicable to the project and project documents.

1.2 SUMMARY
A. This Section includes industrial/commercial chain link fence and gates specifications:
   1. Galvanized steel coated chain link fabric
   2. Galvanized steel framework and fittings
   3. Gates: swing and cantilever slide
   4. Barbed wire
   5. Installation
B. Related Sections:
   1. 01300 Submittals
   2. 01400 Quality Control
   3. 03300 Miscellaneous Cast in Place Concrete

1.3 REFERENCES
A. ASTM A121 Specification for Metallic-Coated Carbon Steel Barbed Wire
B. ASTM A392 Specification for Zinc-Coated Steel Chain-Link Fence Fabric
C. ASTM A780 Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
D. ASTM F552 Standard Terminology Relating to Chain Link Fencing
F. ASTM F567 Standard Practice for Installation of Chain Link Fence
G. ASTM F626 Specification for Fence Fittings
H. ASTM F900 Specification for Industrial and Commercial Swing Gates
I. ASTM F1043 Specification for Strength and Protective Coatings of Steel Industrial Chain Link Fence Framework
J. ASTM F1083 Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures
K. ASTM F1184 Specification for Industrial and Commercial Horizontal Slide Gates
L. ASTM F2200 Specification for Automated Vehicular Gate Construction
M. UL325 Automatic operators: Door, Drapery, Gate, Louver and Window

1.4 SUBMITTALS
A. Shop drawings: Site plan showing layout of fence location with dimensions, location of gates and opening size, cleared area, elevation of fence, gates, footings and details of attachments. Comply with the provisions of Section 01 33 23.
B. Material samples: When required, provide representative samples of chain link fabric, framework and fittings. <Specify size and number of samples>
C. Specification Changes: May not be made after the date of bid.

2. PRODUCTS

2.1 MANUFACTURERS

A. Framework, posts, rails, fabric, and fittings for chain link fence system:

1. **MERCHANTS METALS®** www.merchantsmetals.com
Tech-Info@merchantsmetals.com
Phone: (888) 260-1600 Fax: (888) 261-3600

2.2 CHAIN LINK FABRIC

A. Steel Chain Link Fabric: [Height is 48"] <Select from table below and insert ASTM serial designation, mesh size, wire gauge, coating specification, including class and color when applicable, top/bottom selvage >

1. Zinc-Coated Steel Fabric: ASTM A392 hot dipped galvanized after weaving **(GAW).**
a. Class 1 - 1.2 oz/ft² (366 g/m²)
3. Fabric selvage:
Standard fabric selvage for 2 in (50 mm) mesh 72 in. (1.8 m) high and higher is knuckle finish at one end, twist at the other, [K&T]. < Specify K&K for added safety for play and park applications>
Fabric less than 72 in (1.8 m), knuckle finish top and bottom, K&K. [Manufacturing and installation issues dictate all mesh sizes less than 2 in. (50 mm) have a knuckle selvage for both top and bottom, K&K.]

2.3 ROUND STEEL PIPE FENCE FRAMEWORK

A. Round steel pipe and rail: Schedule 40 standard weight pipe, in accordance with ASTM F1083, 1.8 oz/ ft² (550 g/m²) hot dip galvanized zinc exterior and 1.8 oz/ft² (550 g/m²) hot dip galvanized zinc interior coating.
Regular Grade: Minimum steel yield strength 30,000 psi (205 MPa)
High Strength Grade: Minimum yield strength 50,000 psi (344 MPa)
[Specify Grade: Regular or High Strength]

1. Line post <1.900" outside diameter, zinc coating, 2.72 lb./ft. weight >
2. End, Corner, Pull post <2.375" outside diameter, zinc coating, 2.65 lb./ft. weight >
3. Top, brace, bottom and intermediate rails, 1.660 in. (42.2 mm) OD: <outside diameter, zinc coating, 2.27 lb./ft. weight>

2.4 TENSION WIRE

A. Metallic Coated Steel Marcelled Tension Wire: 7 gauge core (0.177 in.) (4.50 mm) marcelled wire complying with ASTM A824 [Match coating type to that of the chain link fabric] <Insert metallic coating Type and class when applicable>

1. Type II Zinc-Coated, ASTM A817 Class 4 - 1.2 oz/ft² (366 g/m²)

2.5 FITTINGS

A. Tension and Brace Bands: Galvanized pressed steel complying with ASTM F626, minimum steel thickness of 12 gauge (0.105 in.) (2.67 mm), minimum width of 3/4 in. (19 mm) and minimum zinc coating of 1.20 oz/ft² (366 g/m²). Secure bands with 5/16 in. (7.94 mm) galvanized steel carriage bolts.

B. Terminal Post Caps, Line Post Loop Tops, Rail and Brace Ends, Boulevard Clamps, Rail Sleeves: In compliance to ASTM F626, pressed steel galvanized after fabrication having a minimum zinc coating of 1.20 oz/ft² (366 g/m²).
C. Truss Rod Assembly: In compliance with ASTM F626, 3/8 in. (9.53 mm) or 5/16" (7.94 mm) diameter steel truss rod with a pressed steel tightener, minimum zinc coating of 1.2 oz/ft² (366 g/m²), assembly capable of withstanding a tension of 2,000 lbs. (970 kg).
D. Tension Bars: In compliance with ASTM F626. Galvanized steel one-piece length 2 in. (50 mm) less than the fabric height. Minimum zinc coating 1.2 oz. /ft² (366 g/m²).
are to be bolted thru the strap the mesh and thru the terminal post.

2.6 TIE WIRE and HOG RINGS

A. Basic commercial / industrial applications - specify 9 gauge core aluminum alloy ties and hog rings per ASTM F626.

2.7 SWING GATES

A. Swing Gates: Galvanized steel pipe welded fabrication in compliance with ASTM F900. Gate frame members 1.900 in. OD (48.3 mm) <Insert pipe specification> [ASTM F 1083 schedule 40 galvanized steel pipe] or [ASTM F1043 Group IC **(LG-40)** galvanized steel pipe] Frame members spaced no greater than 8 ft. (2440 mm) apart vertically and horizontally. Welded joints protected by applying zinc-rich paint in accordance with ASTM Practice A780. Positive locking gate latch, pressed steel galvanized after fabrication. Galvanized malleable iron or heavy gauge pressed steel post and frame hinges. Provide lockable drop bar and gate holdbacks with double gates. <Match gate fabric to that of the fence system> Gateposts per ASTM F1083 schedule 40 galvanized steel pipe. <Select the gatepost diameter from table 2.9 B> <Insert diameter and weight>

B. Gateposts: Regular Grade ASTM F1083 Schedule 40 pipe

Gate fabric height up to and including 6 ft. (1.2m)		
Gate leaf width	**Post Outside Diameter**	**Weight**
up to 4 ft. (1.2 m)	2.375 in. (60.3 mm)	3.65 lb/ft (5.4 kg/m)
over 4 ft. to 10 ft. (1.2 to 3.05 m)	2.875 in. (73.0 mm)	5.79 lb/ft (8.6 kg/m)
over 10 ft. to 18 ft. (3.05 to 5.5 m)	4.000 in. (101.6 mm)	9.11 lb/ft (13.6 kg/m)
Gate fabric height over 6 ft. to 12 ft. (1.2 to 2.4m)		
Gate leaf width		
up to 6 ft. (1.8 m)	2.875 in. (73.0 mm)	5.79 lb/ft (8.6 kg/m)
over 6 ft. to 12 ft. (1.8 to 3.7 m)	4.000 in. (101.6 mm)	9.11 lb/ft (13.6 kg/m)
over 12 ft. to 18 ft. (2.4 to 5.5 m)	6.625 in. (168.3 mm)	18.97 lb/ft (28.2 kg/m)
over 18 ft. to 24 ft. (5.5 to 7.3 m)	8.625 in. (219.1 mm)	28.58 lb/ft (42.5 kg/m)

2.8 HORIZONTAL SLIDE GATES

A. Cantilever Slide Gates: **SECURE-TRAC®** Made in accordance with ASTM F 1184 Type II Class 2, and in compliance with UL-325, and ASTM 2200. (No substitution) Gate to be made of Aluminum Alloy 6005A-T61. All square members are 2" sq. weighing 0.94 lb/FT (139 kg/m). Complete frame welded to top one piece track and 4" x 2" bottom rail weighing 1.71 lbs./ft. (2.54

kg/m) Supply 2 truck assemblies that are swivel type having lubricated and scaled ball bearing wheels that will align in the track during all normal operations of the gate.

Standard Opening	Standard Support Overhang
11'-0" (3354 mm) through 14'-0" (4267 mm)	7'-6" (2286 mm)
15'-0" (4572 mm) through 22'-0" (6706 mm)	10'-0" (3048 mm)
23'-0" (7010 mm) through 30'-0" (9144 mm)	12'-0" (3857 mm)
31'-0" (9449 mm) through 40'-0" (12192 mm)	16'-0" (4876 mm)

Gates 31'0" (9449 mm) through 40'0" (12192 mm) dual top tracks and two additional truck assemblies. For gates over 40'0" (12192 mm), contact Merchants Metals for custom drawings and specs.

B. Chain Link 2" Fabric: Galvanized After Weaving
C. Finish - choose one: Natural Aluminum or Polymer coated horizontal slide gates and posts shall match the coating type and color as that specified for the fence framework, available colors - black, green, or brown.
D. Gateposts, 4" O.D. (101.6 mm) schedule 40 weighing 9.11 lb/ft (13.6 kg/m). Single gates with single tracks require 3 gate posts. (1 latch post and 2 support posts) Single gates with dual tracks require 5 gate posts. (1 latch and 2 dual support posts) Double gates require twice the number of support posts but do not have a latch post.
E. Electrically operated horizontal slide gates must be manufactured and installed to comply with the safety requirements of ASTM F2200 and UL 325.

2.9 CONCRETE

A. Concrete for post footings shall have a 28-day compressive strength of 2,500 psi. (17.2 MPa).

3. EXECUTION

3.1 CLEARING FENCE LINE

Clearing: Surveying, clearing, grubbing, grading and removal of debris for the fence line or any required clear areas adjacent to the fence <Insert project requirement> [is included in the earthwork contractor's contract under the provisions of Division 31 - Earthwork.] [is not included in the earthwork contractor's contract and is the responsibility of the fence contractor in accordance with the provisions of Division 31 - Earthwork.] The contract drawings indicate the extent of the area to be cleared and grubbed.

3.2 FRAMEWORK INSTALLATION

A. Posts: Posts shall be set plumb in concrete footings in accordance with ASTM F567. Minimum footing depth, 24 in. (609.6 mm) plus an additional 3 in. (76.2 mm) depth for each 1 ft. (305 mm) increase in the fence height over 4 ft. (1220 mm). Minimum footing diameter four times the largest cross section of the post up to a 4.00" (101.6 mm) dimension and three times the largest cross section of post greater than a 4.00" (101.6 mm) dimension. <Insert footing depth and diameter> **<Local codes, site soil conditions, local frost depth, fence height and wind load may require larger diameter or deeper footings - See Chain Link Manufactures Institute – Product Guide and Wind Load Guide CLFMI: WLG 2445>** Top of concrete footing to be [at grade crowned to shed water away from the post or 6 inches (152 mm) below grade] <Insert footing grade requirement> crowned to shed water away from the post. Line posts installed at intervals not exceeding 10 ft. (3.05 m) on center.

B. Top rail: When specified, install 21 ft. (6.4 m) lengths of rail continuous thru the line post or barb arm loop top. Splice rail using top rail sleeves minimum 6 in. (152 mm) long. Rail shall be secured to the terminal post by a brace band and rail end. Bottom rail or intermediate rail shall be field cut and secured to the line posts using boulevard clamps or brace band with rail end. <Fences 12 feet (3.66 m) high or higher require mid rail>

C. Terminal posts: End, corner, pull and gate posts shall be braced and trussed for fence 6 ft. (1.8 m) and higher and for fences 5 ft. (1.5 m) in height not having a top rail. The horizontal brace rail and diagonal truss rod shall be installed in accordance with ASTM F567.

D. Tension wire: Shall be installed 4 in. (101.6 mm) up from the bottom of the fabric. Fences without top rail shall have a tension wire installed 4 in. (101.6 mm) down from the top of the fabric. Tension wire to be stretched taut, independently and prior to the fabric, between the terminal posts and secured to the terminal post using a brace band. Secure the tension wire to each line post with a tie wire. <Install the top tension wire through the barb arm loop for fences having barbed wire and no top rail.>

3.3 CHAIN LINK FABRIC INSTALLATION

Chain Link Fabric: Install fabric to [outside or inside] of the framework maintaining a ground clearance of no more than 2 inches (50 mm). Attach fabric to the terminal post by threading the tension bar through the fabric; secure the tension bar to the terminal post with tension bands and 5/16 in. (7.94 mm) carriage bolts spaced no greater than 12 inches (304.8mm) on center. Small mesh fabric less than 1 in. (25 mm), attach to terminal post by sandwiching the mesh between the post and a vertical 2 in. wide (50mm) by 3/16 in. (4.76 mm) galvanized steel strap using carriage bolts, bolted thru the bar, mesh and post spaced 15 in. (381 mm) on center. Chain link fabric to be stretched taut free of sag. Fabric to be secured to the line post with tie wires spaced no greater than 12 inches (304.8 mm) on center and to horizontal rail spaced no greater than18 inches (457.2 mm) on center. [Aluminum alloy tie wire shall be installed following ASTM F567: Wrap the tie around the post or rail and attached to a fabric wire picket on each side of the post or rail by twisting the tie wire around the fabric wire picket two full turns, cut off excess wire and bend over to prevent injury.] [Preformed 9 gauge power-fastened wire ties shall be installed following ASTM F626: Wrap the tie a full 360° around the post or rail and fabric wire picket, using a variable speed drill, twist the two ends together three full turns, cut off any excess wire and bend over to prevent injury.] Secure the fabric to the tension wire by crimping hogs rings around a fabric wire picket and tension wire.

3.4 GATE INSTALLATION

A. Swing Gates: Installation of swing gates and gateposts in compliance with ASTM F 567. Direction of swing shall be [inward or outward.] Gates shall be plumb in the closed position having a bottom clearance of 3 in. (76 mm), grade permitting. Hinge and latch offset opening space shall be no greater than 3 in. (76 mm) in the closed position. Double gate drop bar receivers shall be set in a concrete footing minimum 6 in. (152 mm) diameter 24 in. (609.6 mm) deep. Gate leaf holdbacks shall be installed for all double gates. Electrically operated gates must be manufactured and installed in compliance with ASTM F2200 and UL 325.

B. Horizontal Slide Gates: Install according to manufacturer's instructions and in accordance with ASTM F567. Gates shall be plum in the closed position, installed to slide with an initial pull force no greater than 40 lbs. (18.14 kg). Double gate drop bar receivers to be installed in a concrete footing as required by site conditions and codes. Ground clearance shall be 3 in. (76 mm), grade permitting. Electrically operated gate installation must conform to ASTM F2200 and UL 325.

3.5 NUTS AND BOLTS

Bolts: Carriage bolts used for fittings shall be installed with the head on the secure side of the fence. All bolts shall be peened over to prevent removal of the nut.

3.6 ELECTRICAL GROUNDING

Grounding: Grounding of the fence and gates is not the responsibility of the fence contractor and not included in the fencing scope of work for this contract. Grounding, when required, shall be specified and included in Contract Section 33 79 00 Site Grounding. A licensed electrical contractor shall install grounding when required.

3.7 CLEAN UP

Clean Up: The area of the fence line shall be left neat and free of any debris caused by the installation of the fence.

END OF SECTION

DIVISION 33 – UTILITIES
SECTION 334211 – GRAVITY STORMWATER GRAVITY PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Self-leveling pourable joint sealants.

C. Joint backings and accessories.

1.02 REFERENCE STANDARDS

A. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

B. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

1.03 SUBMITTALS

A. See Section 013300, Administrative Requirements, for submittal procedures.

B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.
   1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
   2. List of backing materials approved for use with the specific product.
   3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
   4. Substrates the product should not be used on.
   5. Substrates for which use of primer is required.
   6. Substrates for which laboratory adhesion and/or compatibility testing is required.
   7. Installation instructions, including precautions, limitations, and recommended backing materials and tools.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.

1.05 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a one year period after Date of Substantial Completion.

C. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal , exhibit loss of adhesion or cohesion, or do not cure. All joints must be completely sealed with no gaps (vertical or horizontal joints).

PART 2 PRODUCTS

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.03 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C1193.

C. Install bond breaker backing tape where backer rod cannot be used.

D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

E. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

F. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

G. Entire joint shall be contain sealant with no gaps to allow for water intrusion (vertical and horizontal joints).

END OF SECTION