

Project Manual



EMBRY-RIDDLE
AERONAUTICAL UNIVERSITY

P r e s c o t t , A r i z o n a

Athletic Complex
Improvements



ARCHITECTURE & PLANNING

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Not Applicable

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Embry-Riddle Aeronautical University, Inc.

INVITATION FOR PROPOSAL

ATHLETIC COMPLEX IMPROVEMENT

Request for Proposal Bid# 1314121

Issue Date: 2/20/2014

Closing Date: 3/18/2014

Embry-Riddle Aeronautical University, Inc. (the University) is inviting proposals from firms interested in our Athletic Complex Improvement / Renovation Project located in Buildings 80 and 83 in accordance with any and all Specifications and Special Conditions attached hereto.

The intent of the University is to procure pricing for the improvements to the Athletic Complex including site utilities, and infrastructure upgrades. The improvements include, but are not limited to, upgrading existing MPE systems, adding new collegiate team locker rooms, new public restrooms, renovation of the Eagle Gym including adding a new lobby and area for spectator bleacher seating, re-roofing a portion of the existing building, roof enclosure with parapet walls and mansard roof, and new sidewalks for pedestrian flow and safety.

Firms interested in responding to this request for proposal should plan to attend a mandatory pre-construction bid conference on Friday February 28, 2014 at 10:00 a.m. and a second pre-construction bid conference on Thursday March 6, 2014 at 10:00 a.m., and are required to furnish two sets of their proposal package no later than 5:00 P.M. on Tuesday, March 18, 2014

If information other than that provided is required or if there are any questions or comments relating to this request for proposal, submit questions and comments by email to waka@cablone.net no later than 5:00 P.M. Thursday, March 06, 2014. The Projects Office is the only office authorized to change, modify, and clarify the specifications, of this request for proposal. Responses to all questions will be sent out to all bidders by 5:00 P.M. Thursday, March 13, 2014

Proposals may be emailed to beumerc@erau.edu. Send written proposals to: Embry-Riddle Aeronautical University, Attention: Budget & Planning, Bldg 41, 3700 Willow Creek Road, Prescott, AZ 86301. Proposals may also be delivered to the Projects Office, Bldg 41 Room 158. Copies of proposals should not be sent to any other University office or department.

Regards,

Carl Beumer
Project

Manager
Projects Office

INVITATION TO PRE BID CONFERENCE

PROJECT: Improvements for Athletic Complex Buildings 80 and 83

LOCATION: Prescott, Arizona

OWNER: Embry Riddle Aeronautical University, 3700 Willow Creek Road, Prescott, Arizona 86301-3720

An initial pre-bid conference for all bidders will be held at Embry-Riddle Aeronautical University, 3700 Willow Creek Road, Prescott, Arizona 86301 on Friday February 28, 2014 at 10:00 am, at Building 80. A second pre-bid conference will be held at Embry-Riddle Aeronautical University, 3700 Willow Creek Road, Prescott, Arizona 86301 on Thursday, March 6, 2014 at 10:00 a.m., at Building 80. (Please meet in parking lot on the West side of the Building).

This meeting is mandatory and all prospective bidders are required to attend.

BIDDER INVITATION LIST:

The following companies are invited to bid on this project:

B's Contracting
Haley Construction
Kenson Construction
KNA Construction
N-Shea Group LLC
RY-TAN Construction

PROPOSAL SUBMISSION FORMAT REQUIREMENTS

The following information materials and forms are required as part of your proposal submission.

Please submit your response and all required forms using the following format, indexed and tabbed according to this list:

Completed Yes/No	Section	Description
	One	RFP DOCUMENT AND VENDOR PROFILE Provide the entire RFP document, initial each page, complete and sign the <i>Vendor Information Form</i> (included).
	Two	IMPLEMENTATION Provide an estimated schedule timeline and implementation plan for the project, including any downtime or loss of service that may affect the University. Successful bidder will be required to present a firm detailed implementation plan and schedule upon bid award.
	Three	WARRANTIES Provide a statement detailing the warranty for the goods and/or services provided. All material shall be fully guaranteed per the manufacturer's warranty period from the date of final acceptance to the University against defects in material and workmanship. If the material fails in normal service, the Firm shall be held liable for replacement of the defective material and all charges for pickup, shipment, and delivery to and from the University. All labor shall be guaranteed for a period of not less than 2 years from the date of final acceptance.
	Four	INSURANCE REQUIREMENTS Supplier <u>MUST</u> provide Embry-Riddle Aeronautical University with evidence of a properly executed Certificate of Insurance, or copy of COI, showing Worker's Compensation Insurance as required by Arizona State Statutes, Automobile Insurance , and General Liability Insurance coverage. The proof of Contractor's coverage <u>MUST</u> be received with the proposal and approved by the Embry-Riddle Aeronautical University Risk Manager prior to the commencement of any activities under this contract. These policies of insurance shall name "Embry-Riddle Aeronautical University, Inc." as additional insured with respect to operations performed under this contract, protecting the insured and the University as though a separate policy had been issued to each. These policies shall be primary and shall not require contribution from any insurance carried by the University.

	Five	TAXPAYER IDENTIFICATION NUMBER AND CERTIFICATION Provide completed and signed <i>Form W-9</i> (provided).
	Six	PRICING Provide pricing on attached bid form. ERAU is not tax exempt include sales tax in proposal price.
	Seven	VENDOR CONTRACT Should your Firm require that a standard company agreement be executed in order to contract, a copy of this agreement MUST be received along with this proposal package. If submitted, this contract will be evaluated to make certain that it does NOT deviate from the conditions of this proposal package. Should the submitted company contract deviate from the terms and conditions of the proposal package, said contract will be modified by the University. Once this proposal has been awarded and a valid purchase order number assigned, no other company contract will be considered. Any contracts submitted by the proposer AFTER such award may be considered a counter offer and may be subject to rejection and/or purchase order cancellation.
	Eight	INFORMATION TECHNOLOGY REQUIREMENTS AND SPECIFICATIONS FOR ANY EQUIPMENT PROPOSED AND EQUIPMENT IMPACTING ERAU INFORMATION TECHNOLOGY INFRASTRUCTURE Provide specifications such as server requirements, workstation requirements, network interfacing, software requirements, and power requirements.
	Nine	QUALIFICATIONS OF KEY PERSONNEL & LIST OF ANY SUBCONTRACTOR THAT WILL BE PERFORMING ANY OF THE WORK Provide qualifications for key project personnel including: Project Designer, Project Manager, Supervisor or On-site Foreman, and any other key personnel. Provide a list of Sub-contractors that you will use, and the source of any day laborers.
	Ten	REFERENCES Provide completed <i>References Form</i> (included) with at least three project references for previous projects of similar size and scope.
	Eleven	Contractor's License Provide copies of any and all current contractor licenses held by this contractor that are applicable to this project.

SPECIAL CONDITIONS

Should your Firm require that a Standard Company Agreement be executed in order to contract for this service, a copy of your Agreement must be received along with this proposal package.

GENERAL CONDITIONS

Bidders agree to furnish all materials, permits, labor, tools, equipment, services and related items, whether or not specifically mentioned herein, to satisfy the full intent of these specifications and general conditions.

Bidders must be responsible for clean-up of job site when work is done on site.

Bidders must be responsible for, or back charge for, repairs to finishes incurred by personnel. Any damage done to existing concrete, paint, walls, woodwork, flooring, doors, etc., shall be the responsibility of the Contractor.

All Contractors must be licensed. **A copy of the license must be included with this proposal.**

Workmanship must be done in a professional manner and meet all codes when applicable. Poor workmanship will not be accepted.

Withdrawal of Proposal

At any time prior to the hour and date set for the opening of proposals, a proposer may withdraw the proposal. This will not preclude the submission of another proposal prior to the hour and date set for the opening of the proposal.

After the scheduled time for the opening of the proposals, no proposer will be permitted to withdraw the proposal unless the award is delayed for a period exceeding ninety (90) days.

No Bid

If not bidding, respond by returning the proposal and completed Statement of No Bid Form, provided herein, for explaining your rationale in not submitting a proposal.

Proposal Opening

As the University is a private entity, all proposal openings are closed to the public and none of the information is made public record.

Materials Guaranteed

All material shall be fully guaranteed per the manufacturer's warranty period from the date of final acceptance to the University against defects in material and workmanship. If the material fails in normal service, the Firm shall be held liable for replacement of the defective material and all charges for pickup, shipment, and delivery to and from the University. All labor shall be guaranteed for a period of not less than 2 years from the date of final acceptance.

Prices

Firm Prices shall be proposed and remain firm for the entire contract period.

Taxes

The University does not pay Federal Excise Tax on direct purchases of tangible personal property. The University does not pay Florida State Sales Tax. The University does pay Arizona and Prescott Sales Tax.

Payment Terms

The Proposer shall be paid Net 30, upon submission of properly certified invoices to the purchaser at the prices stipulated in this proposal, less any payment discounts, as provided in U.S. dollars. Invoices shall contain a valid purchase order number. Failure to follow these instructions may result in a delay of processing invoices for payment.

Failure in Performance

In the event of failure by the proposer to provide the contracted services, the University may contract or otherwise perform the service and charge to the awarded proposer any cost incurred by the University related to the performance of such service and deduct such cost from any contract payments. The University will convey the areas of failure to the awarded proposer, US Mail, Return Receipt Requested.

The proposer will then have thirty calendar days to address and rectify the shortcomings to the satisfaction of the University. Should the issues not be solved to the satisfaction of the University within the thirty days, then the University reserves the right to exercise this option and hire a third party to complete the areas of service as needed.

Subcontracts

The Firm or its subcontractor shall insert in any subcontracts the text of all contract requirements. The Firm shall be responsible for compliance by any subcontractor with the terms of the contract.

Remedial Actions

It is understood that the proposer shall be liable for any damage to the University resulting from failure to perform within the specified time. Remedial actions shall not be construed to waive any rights of the University. Election of remedial action by the University shall not relieve the proposer of the requirement to provide contracted services without further delay, nor preclude the University from taking other remedial action. The proposer must have a designated representative available to promptly correct deficiencies.

Additional Terms and Conditions

No additional terms and conditions, other than those included in this proposal response, shall be evaluated or considered. It is understood and agreed the conditions and requirements as outlined in this proposal solicitation are the only conditions applicable to this proposal and the proposer's authorized signature affixed to the proposal form attests to this. Should you firm have a standard contract that would need to become part of this service, please include it with your proposal response. Any terms of this proposal document shall take precedence over the terms of the contract that deviate from this proposal package.

Awards

The University reserves the right to accept or reject any or all proposals, to waive irregularities, and to accept the proposal which satisfies specified requirements to the best interest of the University. Any decision shall be considered final and not subject to recourse.

Legal Fees

The proposer will be responsible for any attorney and/or court fees in the event proposer defaults and court action is required.

Liens

The proposer shall keep the University free and clear from all liens asserted by any person, firm, or corporation for any reason whatsoever, arising from the furnishing of services, (whether for work or labor performed or for materials or equipment furnished) by the proposer pursuant to the terms of any contract awarded.

Indemnification

The proposer shall save and keep harmless and indemnify the University against any and all liability, claims, and costs of whatsoever kind and nature of injury to or death of any person or persons and for loss or damage to any property occurring in connection with or in any way incident to or arising out of the performance of work in connection with this contract, resulting in whole or in part from the negligent acts, fault or omissions of the proposer, or any employee, agent, or representative of the proposer.

Extension

The Purchasing Department reserves the option to extend the period of this contract, or any portion thereof, for an additional contract period. Extension of the contract period shall be by mutual agreement in writing.

Cancellation

Both parties shall have the right to terminate the contract, with or without cause, at any time during the term upon giving the other party thirty (30) days prior notice in writing, via Certified Mail, Return Receipt Requested.

Assignment

No proposer to whom any contract for these specifications shall be awarded shall assign, transfer, convey, sublet, or otherwise dispose of the same or his right, title, or interest therein, or his power to execute such contract, to any other persons or corporation without the express consent in writing from the Director of Purchasing.

Liability

The Firm shall hold and save the University, it's officers, agents and employees harmless against claims by third parties resulting from the supplier's breach of this contract or the supplier's negligence.

Selection Criteria

After receipt of proposal/proposal(s), the University may use the following criteria, in addition to price, in the proposer selection process:

1. The ability of the proposer and his staff to perform their services, as specified, within the specified time.
2. The quality of performance on previous contracts and services per reference checks.
3. The character, integrity, reputation, judgment, experience and efficiency of the proposer and staff.

Selection shall be made of proposer deemed to be fully qualified and best suited among those submitting proposals, on the basis of the factors involved in Request for Proposal, including price. Price shall be considered, but need not be the sole determining factor.

Terms and Conditions

Any terms and conditions that deviate from those in this bid will be altered to reflect the bid. Failure of the Firm to allow for this may be grounds for dismissal of your bid and cancellation of any orders that may result from this bid.

Funding

Award of this contract is based upon availability of University funds.

GENERAL CONDITIONS AND REQUIREMENTS FOR CONTRACTORS

Materials, Labor, Permits, etc.

1. Furnish all materials, permits, labor, tools, equipment, services, and related items, whether or not specifically mentioned herein, to satisfy the full intent of these specifications and general conditions and requirements. Any deviations in materials will be replaced at the expense of the contractor.
2. Be responsible for having available required personnel, and supervisory personnel capable of completing the construction and/or installation as set forth in these specifications.
3. Be responsible for daily cleanup of job site. It is assumed common construction practices / common sense will prevail.
4. Be responsible for, or back charge for, repairs to finishes incurred by construction personnel. Any damage done to existing concrete, paint, walls, woodwork, doors, etc., shall be the responsibility of the contractor.
5. All contractors must be licensed. A copy of the license MUST be included with this proposal.
6. Workmanship must be done in a professional manner and meet all federal and local codes. Poor workmanship will not be accepted, and it will be the contractor's responsibility to correct faulty work at his own expense. The University reserves the right to define what is considered poor workmanship and withhold payment until it is corrected. The judgment of the University shall be final.

Insurance, Liens, and Warranties

1. Contractors MUST provide Embry-Riddle Aeronautical University with evidence of a properly executed certificate, or copy, showing worker's compensation insurance as required by Arizona State Statutes, Automobile insurance and General Liability insurance coverage. The proof of contractor's coverage MUST be received with the bid submittal and approved by the ERAU Risk Manager. If you have performed work on campus before, it does not mean we have a copy of this information. You are required to resubmit your current certificates of insurance each time you bid.
2. If applicable, contractor must provide written release of all liens upon completion of job.
3. All material shall be fully guaranteed per the manufacturer's warranty period from the date of final acceptance to the University against defects in material and workmanship. If the material fails in normal service, the Firm shall be held liable for replacement of the defective material and all charges for pickup, shipment, and delivery to and from the University. All labor shall be guaranteed for a period of not less than 2 years from the date of final acceptance.

4. When applicable, the contractor shall be responsible for any and all repairs to concrete, sod, shrubbery, etc. caused while carrying out the completion of the job. All concrete, etc. must match the existing surface.
5. The contractor is also responsible for all underground utility lines, etc. that he may come in contact with during the course of this work. Be aware utilities on campus were installed throughout the years during different periods of code enforcement and are not necessarily at standard regulation depth as required today. Use extreme caution while performing any excavation near existing utilities, excavation by hand may be required in some circumstances. Any damaged to utilities by the contractor due to failure to follow the above, carelessness or lack of Blue Stake will be repaired at the contractors expense. ALL LOCATING OF UTILITIES IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR.

Scheduling, Visits, etc.

1. Each bidder may need to visit the project site before submitting a bid in order to match the units to the existing. All visits must be approved by the project management office. No disruption to normal university activities will be allowed.
2. For scheduling of work, site visits, and further information, contact Carl Beumer 928-777-3950 or 928-642-6559 (Cell)
3. General construction hours on campus are Mon – Fri between 7:00 a.m. to 5:00 p.m. Projects department hours are Mon - Fri, 7:00 a.m. to 5:00 p.m.
4. The Contractor will conduct weekly construction update meetings with representatives of the owner, general contractor and all sub-contractors.
5. Make sure arraignments are made 48 hrs in advance for work after business hours or on non-business days.
6. Sign in and out each day (see sign in/out form). If applicable, keys must be returned to the Project Manager at the end of each day.
7. Project Manager must be notified when you are leaving the job site at the end of the day.

Safety

1. Because the campus will remain open during construction, it is imperative that all contractors maintain a safe working environment making every effort to protect the students and staff at all times. The Contractor is responsible for all safety precautions necessary at the job site. All barricades, cones, fencing, caution tape, etc. shall be supplied by the contractor.
2. Contractor is also required to uphold all OSHA Safety Standards while on campus and shall have a working "Project Safety Program". Contractor shall comply with all State, Federal and Local safety regulatory guidelines this includes all regulations requiring contractor's employees to have, maintain and use all necessary Personal Protection Equipment.

3. Backhoes, excavators, and such, will not be allowed to work within 100 feet of a classroom or meeting room, unless otherwise scheduled accordingly.
4. Existing floor coverings to be covered/protected from construction debris.
5. ERAU Safety & Security will not be responsible for the security of equipment, and or tools left on the job site.
6. Visually inspect site each day in an effort to remedy safety issues.
7. Do not enter dorms without prior approval from the Projects Dept. and the ERAU Housing Department; nor enter before 9:00 a.m. any day.
8. Ensure all buildings are secure when not working.
9. ERAU is a tobacco free campus there will be no smoking or tobacco use of any kind allowed in any building, residence hall, parking area, grounds or parked vehicles on university owned or leased property

Transportation

1. Vehicles are not to be driven or parked on the grass unless essential to the actual work. In such cases, any repairs resulting from such damage is the responsibility of the successful bidder. Trees on site may not be removed unless directed, IN WRITING, by the Physical Plant. In the event that sod or shrubbery must be moved, they will be preserved and reinstalled as appropriate. All tree or shrubbery removal, unless otherwise approved, must be done between dusk to dawn...no exceptions.
2. University shall NOT, unless otherwise indicated in this document, provide a storage site for materials, supplies and tools. The awarded Contractor shall be responsible for transportation such items to and from the job site on a daily basis. Materials, trailers, or any other items used during the course of construction, must be placed within the predetermined "construction zone", outlined during the "Pre-Construction Meeting".
3. Contractor's vehicles and vehicles of his employees or sub-contractors working for him shall park in parking lots as designated by the ERAU Project Manager prior to the beginning of construction.

General Notes

1. Vendor is responsible for the prompt delivery of all bid/quote documentation to the Projects Department no later than the time specified. Late mail delivery is not a valid cause for a bid/quote extension. All bidders must quote delivered prices, FOB: DESTINATION.
2. The awarded vendor, if using subcontractors, IS responsible for their behavior and professionalism while on the job site. Inappropriate dress and conduct will NOT be tolerated. The University reserves the right to request that the awarded contractor remove any subcontractors from the University work sites it feels do not represent and uphold the standards of the University. The opinion of the University shall be final.

3. Do not allow your employees or sub contractors' employees whistle or make comments to any students, faculty or staff on campus.
4. Provide qualifications for key project personnel including: Project Designer, Project Manager, Supervisor or On-site Foreman, and any other key personnel. Provide a list of Sub-contractors that you will use, and the source of any day laborers.
5. On some projects, a work schedule will be established on the start-up of the project and will detail the scope of work to be accomplished EACH DAY. It will be the responsibility of the awarded Contractor to make certain that this schedule is adhered to. Failure to do so may result in liquidated damages being deducted from the final invoice prior to payment.
6. Payment terms will be NET 30 upon final acceptance by Embry-Riddle Aeronautical University and exchange for final release of liens. Embry-Riddle Aeronautical University is not tax exempt therefore; sales tax must be included in all invoices. In addition, include the Purchase Order number on all invoices.
7. Any document or attached drawings are intended to be a guide and reference only. Contractor is responsible for field verifying all noted measurements, dimensions mechanical locations, features, and quantity takeoffs identified herein.
8. All Information Technology / Special Systems shall follow IT "Standardized Wiring Requirements for New Construction and Renovations" document located at <http://stats.pr.erau.edu/maps/PRCwiring.doc>.
9. At the conclusion of the project, after final acceptance but before final payment, the General Contractor as well as every subcontractor will be required to provide Embry-Riddle with the following documents:
 - a. Operation and Maintenance Manuals listing manufacturer's name and model # for each product used in their portion of the project.
 - b. Manufacturer's warranty documents and information stating warranty period and terms for all products.
 - c. As-Built drawings showing any and all changes made during construction that are not documented per the original design. This includes but is not limited to location of underground utilities, under slab construction and mechanical trade locations, structural changes, Plumbing piping, HVA/C ducting, Electrical conduit and wiring, Low voltage conduit and wiring, etc.

ERAU reserves the right to withhold all or part of the final payment if the above documents are not in the ERAU Project Manager's judgment 100% complete and accurate.

GENERAL RFP INFORMATION

The RFP is designed to provide potential suppliers with sufficient basic information to submit proposals meeting minimum requirements, but is not intended to limit a proposal's content or to exclude any relevant or essential data. Suppliers are at liberty and are encouraged to expand upon the specification to demonstrate service capability under any proposal.

Specifications

It is not the intention of specifications to rule out or eliminate any prospective bidder. If the materials or services you intend to bid do not comply with the specifications as they are written, you are instructed to attach to your bid proposal a complete itemization and explanation for each deviation or variation to the specifications. The University will, at its discretion, consider or deny any deviation and award the contract based on the service that best meets the University's needs. The bidder shall not bid equipment and service of a lesser quality than specified.

Economy of Preparation

ERAU is committed to the principles of sustainability, which includes reducing our environmental impact. Therefore, we ask that proposals be prepared simply and economically, providing a straightforward, concise description of the Proposer's capabilities to satisfy the requirements of the RFP. Special bindings, colored displays, promotional materials, etc., are not desired. Emphasis should be on completeness and clarity of content.

Effective Date of Communications / Signatures Sent By Facsimile

The parties agree that for purposes of this contract and any amendment or modification thereto, or for any other notice or communication between the parties, signatures sent or received by facsimile transmission will be considered as enforceable and valid as original signature by the party signing. The effective date of communications between the parties will be determined as follows:

1. Communications sent via U.S. Mail or private mail delivery service (i.e. Fed Ex) will be effective as of the date sent;
2. Communications sent via facsimile will be considered effective as of the date and time on the facsimile confirmation sheet retained by the sender.

Evaluation of Proposals

The University reserves the right in awarding the contract to consider the competency, responsibility, and suitability of the proposer, as well as the services provided. The University may also take into consideration the references, experience, reputation, financial standing, and the ability of the proposer to provide an advantageous time schedule for providing service. Price shall be considered, but need not be the sole determining factor.

The University further reserves the right to accept or reject any or all proposals, to waive any irregularities or informalities, to request new proposals, and to award the contract in the best interests of the University.

Issuing Office

The ERAU Project Management Department is the issuing office for this document and all subsequent addenda relating to it. The Project Management Department is the sole point of contact with regard to all procurement and contractual matters relating to requirements described herein. The Project Management Department is the only office authorized to change, modify, clarify, etc., the specifications, terms and conditions of this request for proposal, and any contract awarded as a result of this request for proposal.

All communication concerning this RFP should be in writing and addressed to:

Project Manager

Email: beumerc@erau.edu

Communication with any other University employee, unit, department, or organization concerning the RFP is not binding on the University and shall in no way modify the RFP or the obligation of the University or the Vendor, and may disqualify the proposal.

The University reserves the right to issue an addendum to this RFP at any time as a result of questions, change in acquisition schedule, or other matters. In the event that it becomes necessary to revise this RFP, in whole or in part, an addendum will be provided by the Purchasing Department to all vendors on record of having received the original RFP.

The University also reserves the right to cancel or re-issue this RFP.

CONTRACT INSURANCE REQUIREMENTS

The vendor shall procure, maintain and provide evidence of the following insurance coverages during the life of this contract, in such form and with such carriers as approved by the University, at the vendor's sole expense. The insurance companies providing coverage must maintain an A.M. Best rating of A-; VII or better and be duly authorized by the Department of Insurance of the State to do business in the State.

1. The following minimum coverages and limits are required:

- a. **COMPREHENSIVE GENERAL LIABILITY** including, but not limited to, the following coverages: professional, premises/operations, products/completed operations, contractual, personal injury, broad form property damage, and damage to rented premises (\$1,000,000).

Bodily Injury and Property Damage	\$ 1,000,000 each occurrence
(Combined Single Limit)	\$ 2,000,000 general aggregate

- b. **COMPREHENSIVE AUTOMOBILE LIABILITY** including owned, hired and non-owned automobile coverages.

Bodily Injury and Property Damage	\$ 1,000,000 each accident
(Combined Single Limit)	

- c. **WORKER'S COMPENSATION** (Including Employers Liability) as required by State law for all of the vendor's employees engaged in work at the University.

2. The vendor shall certify that such insurance is carried by any subcontractor or supplier providing goods and services to the University.
3. The vendor's employees will be on ERAU premises solely in connection with their performance of official duties for the vendor, and it is the intent of the parties to this agreement that Workers Compensation benefits shall be the sole recovery available for any and all of the vendor's employees injured on the job in connection with the vendor's services to or on behalf of ERAU, or while on ERAU owned or controlled premises. Accordingly, the vendor shall upon demand of ERAU defend and indemnify ERAU for any and all claims or demands of whatever kind or nature and wherever brought by any employee of the vendor for any harm or injury arising as a result of that employee's performance of duties for the vendor, in connection with this contract, or while on, in, or about any property owned or controlled by ERAU.
4. Insurance certificates indicating the required coverages shall be furnished to the University for approval throughout the term of the contract.
5. These policies of insurance shall name "Embry-Riddle Aeronautical University, Inc." as additional insured with respect to operations performed under this contract, protecting the insured and the University as though a separate policy had been issued to each. These policies shall be primary and shall not require contribution from any insurance carried by the University.

6. These policies shall contain a provision requiring thirty (30) days written notice of cancellation to the University before cancellation, reduction or other modification of coverage may become effective.
7. At any time during contract performance and upon request of the University, the vendor shall provide the University certified true copies of these policies and any changes thereto.
8. In the event that the vendor fails to maintain and keep in force the insurance as provided herein, the University shall have the right to cancel and terminate this contract forthwith and without notice.

VENDOR INFORMATION FORM
Embry-Riddle Aeronautical University, Prescott Campus

FIRM NAME IN FULL: _____

ADDRESS: _____

CITY: _____ STATE: _____ ZIP CODE: _____

CONTACT PERSON: _____

TELEPHONE NUMBER: _____ FAX NUMBER: _____

CELLULAR NUMBER: _____

E MAIL ADDRESS: _____

FEDERAL ID NUMBER: _____

I certify that this proposal is made without prior understanding, agreement, or connection with any corporation, firm or person submitting a proposal for the same materials, supplies, or equipment, and is in all respects fair and without collusion or fraud. I agree to abide by all conditions of this proposal and certify that I am authorized to sign this proposal for the proposer and that the proposer is in compliance with all requirements of the Proposal Invitation.

SIGNATURE

DATE

NAME (PRINTED)

TITLE

REFERENCES

Embry-Riddle Aeronautical University, Prescott Campus

The respondent must provide at least three project references for previous projects of similar size and scope.

#1) Name: _____

Company Name: _____

Contact Person: _____

Phone Number: _____

E-Mail: _____

Year Project Performed: _____

#2) Name: _____

Company Name: _____

Contact Person: _____

Phone Number: _____

E-Mail: _____

Year Project Performed: _____

#3) Name: _____

Company Name: _____

Contact Person: _____

Phone Number: _____

E-Mail: _____

Year Project Performed: _____

STATEMENT OF NO BID
Embry-Riddle Aeronautical University, Prescott Campus

PROPOSAL NUMBER
(Proposal Name)

In order to encourage an equitable bidding process, it is important that the University receive as many proposals as possible. If your company will not be submitting a response to this proposal/bid package, please return this form to the University Project Management Department indicating your reason for non-response.

Your willingness to share your rationale for NOT bidding this project will assist us in determining what steps, if any, are needed to further enhance the process.

Thank you for your time and consideration,

Company Name: _____

Signed By: _____

We are not bidding the above-referenced bid/proposal for the following reason(s):

Please email this page to beumerc@erau.edu or fax to
928-777-3950

Request for Taxpayer Identification Number and Certification

Give Form to the
requester. Do not
send to the IRS.

Print or type See Specific Instructions on page 2.	Name (as shown on your income tax return)	
	Business name/disregarded entity name, if different from above	
	Check appropriate box for federal tax classification: ☐ Individual/sole proprietor ☐ C Corporation ☐ S Corporation ☐ Partnership ☐ Trust/estate ☐ Limited liability company. Enter the tax classification (C=C corporation, S=S corporation, P=partnership) ▶ _____ ☐ Other (see instructions) ▶ _____	☐ Exempt payee
	Address (number, street, and apt. or suite no.)	Requester's name and address (optional)
	City, state, and ZIP code	
List account number(s) here (optional)		

Part I Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. The TIN provided must match the name given on the "Name" line to avoid backup withholding. For individuals, this is your social security number (SSN). However, for a resident alien, sole proprietor, or disregarded entity, see the Part I Instructions on page 3. For other entities, it is your employer identification number (EIN). If you do not have a number, see *How to get a TIN* on page 3.

Note. If the account is in more than one name, see the chart on page 4 for guidelines on whose number to enter.

Social security number									
				-			-		
Employer identification number									
				-					

Part II Certification

Under penalties of perjury, I certify that:

1. The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me), and
2. I am not subject to backup withholding because: (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding, and
3. I am a U.S. citizen or other U.S. person (defined below).

Certification instructions. You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and generally, payments other than interest and dividends, you are not required to sign the certification, but you must provide your correct TIN. See the instructions on page 4.

Sign Here	Signature of U.S. person ▶ _____	Date ▶ _____

General Instructions

Section references are to the Internal Revenue Code unless otherwise noted.

Purpose of Form

A person who is required to file an information return with the IRS must obtain your correct taxpayer identification number (TIN) to report, for example, income paid to you, real estate transactions, mortgage interest you paid, acquisition or abandonment of secured property, cancellation of debt, or contributions you made to an IRA.

Use Form W-9 only if you are a U.S. person (including a resident alien), to provide your correct TIN to the person requesting it (the requester) and, when applicable, to:

1. Certify that the TIN you are giving is correct (or you are waiting for a number to be issued).
2. Certify that you are not subject to backup withholding, or
3. Claim exemption from backup withholding if you are a U.S. exempt payee. If applicable, you are also certifying that as a U.S. person, your allocable share of any partnership income from a U.S. trade or business is not subject to the withholding tax on foreign partners' share of effectively connected income.

Note. If a requester gives you a form other than Form W-9 to request your TIN, you must use the requester's form if it is substantially similar to this Form W-9.

Definition of a U.S. person. For federal tax purposes, you are considered a U.S. person if you are:

- An individual who is a U.S. citizen or U.S. resident alien,
- A partnership, corporation, company, or association created or organized in the United States or under the laws of the United States,
- An estate (other than a foreign estate), or
- A domestic trust (as defined in Regulations section 301.7701-7).

Special rules for partnerships. Partnerships that conduct a trade or business in the United States are generally required to pay a withholding tax on any foreign partners' share of income from such business. Further, in certain cases where a Form W-9 has not been received, a partnership is required to presume that a partner is a foreign person, and pay the withholding tax. Therefore, if you are a U.S. person that is a partner in a partnership conducting a trade or business in the United States, provide Form W-9 to the partnership to establish your U.S. status and avoid withholding on your share of partnership income.

INSTRUCTIONS TO BIDDERS

To be considered, bids shall be made in accordance with these Instructions to Bidders.

CONTRACT DOCUMENTS:

The Contract Documents will be available February 13, 2014, at Embry-Riddle Aeronautical University (ERAU), Projects Office, Building 41, 3700 Willow Creek Road, Prescott, AZ 86301. Contract Documents will be issued only to selected Contractors. Selected Contractors are limited to (1) one set of contract documents at the Owner's expense. The Owner would appreciate the return of the contract documents in good order upon completion of the bidding process.

INTENT ON DOCUMENTS:

Plans and specifications are cooperative and supplementary. Portions of the work that can be best illustrated on the plans may not be included in the specifications, and portions best described by specifications may not be depicted on the plans. It is the intent of the Contract Documents to include all labor, materials, and services necessary for the proper and complete construction of the project as shown or implied on the plans and described in the specifications.

PRE-BID MEETING:

One pre-bid meeting is to be held at the site as indicated in the Invitation for Bids. Attendance of the pre-bid meeting is mandatory for Contractors submitting a bid. The Contractor shall acknowledge attendance of pre-bid meetings on the Bid Form in space provided.

EXAMINATION:

Before submitting a bid, bidders shall carefully examine the Plans, Specifications, and other Contract Documents, visit the site of the work, and fully inform themselves as to all existing conditions and limitations, and shall include in the bid a sum to cover the cost of all items included in the Contract. The bidder, if awarded the Contract, shall not be allowed any extra compensation by reason of any matter or thing concerning which bidder could have fully informed himself prior to the bidding.

INTERPRETATIONS OF PLANS AND ADDENDA:

Should a bidder find discrepancies in, or omissions from, the Plans, Specifications, and other Contract Documents, or should he be in doubt as to their meaning, he shall at once notify the ERAU Project Manager (P.M.), who will send a written Addendum to all bidders. Neither ERAU

nor the Architect will be responsible for oral instructions or information. Questions received less than 72 hours before the bid opening will not be answered.

Any Addenda issued by ERAU during the time of bidding shall be included in the bid and shall become part of the Contract Documents. Acknowledge receipt of Addenda on the Bid Form in space provided.

SUBSTITUTION OF MATERIALS:

No substitutions allowed.

BIDS:

Bids, to be entitled to consideration, shall be made upon the Bid Form, provided therefore. All blank spaces shall be filled, the signature shall be in longhand, and the completed form shall be submitted without alterations or erasures. Where bidder is a corporation, bid shall be signed by the legal name of the corporation followed by the name of state of incorporation and the legal signature of an officer authorized to bind the corporation to a contract.

Bids shall be addressed to ERAU and delivered in a sealed envelope containing a Subcontractor List, and other information required by ERAU, marked with the project name shown on the Bid Form, and shall bear the name of the bidder. Or bid package can be submitted electronically email to beumerc@erau.edu

All bids shall remain valid for the periods stated in the Bid Form and the successful bidder shall be prepared to begin construction within ten (10) days after signing of the Contract.

Bids shall be delivered at the time and place stated in the Invitation for Bids. Bids will be opened privately for consideration.

Bids may not be modified after submittal. A bidder may withdraw his bid at any time prior to bid opening, but may not resubmit it. No bid may be modified or withdrawn after the bid opening except where the award of the Contract has been delayed for 46 days. Telephonic modification of bid will not be accepted.

The competency and responsibility of bidders and of their proposed subcontractors will be considered in making the Award.

SUBCONTRACTOR LISTING:

Complete the Subcontractor List Form by providing a single name only for each type of work. Submit form in separate envelope contained in envelope containing bid. ERAU reserves the right to reject certain subcontractors.

COPIES FURNISHED:

Contractor will be furnished one (1) sets of Plans and Specifications free of charge. Additional copies may be obtained from the ERAU at cost of the reproduction.

INCLUSION OF ALL WORK:

If upon the completion of the Bid Form any work shown on the Plans or specified is not included in one of the Bid Items, notify ERAU of any work not so included at least five (5) days prior to bid opening. Bids may not be qualified as to work excluded. After bids are opened ERAU's determination of the intent of the Plans, Specifications, and Bid Form, as to the work included in each Bid Item, will be final.

PERMITS:

All charges for building permits and plan review fees payable to the City if required will be paid by ERAU. Do not include these costs in the bid or as an allowance.

AWARD OF CONTRACT:

ERAU reserves the right to accept any bid, reject any or all bids without showing cause, and to disqualify any subcontractor prior to start of work.

If a contract is awarded, award will be made to the Bidder whose aggregate bid, consisting of the Base Bid and any Additive/Deductive Bid Items selected by ERAU, is determined to be the best and most responsive bid. Completion time and quality of work are of the essence and will be considered when proposals are evaluated.

ERAU further reserves the right to waive any informality in bidding and to delete any portion of the work at the ERAU's option.

ARCHITECTURAL AND ENGINEERING SERVICES:

It is understood that normal architectural and engineering liaison for the purpose of interpretation of the drawings and specifications is provided for by ERAU. Should any services of the Architect and/or Engineer be required to assist in the corrections of errors or omissions in construction by the Contractor, or services of the Architect and/or Engineer be required because of changes in structural or equipment where the Contractor has requested approval of substitute methods or materials these services will be provided by the Architect and/or his Engineer at his standard hourly rates, and shall be paid for by the Contractor.

END OF SECTION

BID FORM

TO: Embry-Riddle Aeronautical University
Project Office, Bldg. 41 Room 158
3700 Willow Creek Road, Prescott, AZ 86301
Attention: Carl Beumer

Re: Athletic Complex Improvement
Building 80 1314121
Embry-Riddle Aeronautical University
Prescott, Arizona

We, the undersigned, propose to do all the work and furnish all the labor, expendable equipment, necessary tools, and materials necessary for the construction of the subject project as set forth in the Construction Documents prepared by W. Alan Kenson & Associates, P.C., Prescott, Arizona.

We further declare that we have carefully examined the Project Scope of Work and all sheets of the Drawings, that we have made a personal examination of the site, and that we understand the exact scope of the Project.

We acknowledge receipt of the following Addenda and have included their provisions in this Bid:

Addendum No. _____,	Dated _____
Addendum No. _____,	Dated _____
Addendum No. _____,	Dated _____

We acknowledge attending the following pre-bid meeting(s):

Pre-bid meeting on 2/28/2014 _____ Initial
Second Pre-bid meeting on 3/06/2014 _____ Initial

In submitting this Bid, we agree:

1. If notified of the acceptance of this Bid within forty-five (45) calendar days of the bid opening date, to execute a Contract for the work for the prices hereinafter stated in the Bid Schedule on the form "Standard Form of Agreement between Owner and Contractor," AIA Document A101, as modified in Form of Agreement.
2. To accept the provisions of the Instructions to Bidders.
3. To accomplish the work in accordance with the Contract Documents.
4. To commence the project on 5/5/2014 with completion of the project on or prior to 5/31/2015 after receiving notice to proceed.

BID SCHEDULE:

Base Bid: _____ (\$ _____)

Sales Tax: _____ (\$ _____)

Total Base Bid: _____
(\$ _____)
(Dollars)

Date: _____ Contractor: _____

By: _____ Title: _____

Address: _____

Telephone Number: _____ Contractor's License Number: _____

(Seal, if corporation)

SUBCONTRACTOR LIST FORM

This attachment to the Bid Form shall be submitted along with the Bid Form, each of which shall be placed in separate sealed envelopes. Lists submitted by unsuccessful bidders will be returned unopened.

Each envelope shall bear the bidders name and identification of contents contained therein.

The bidder must list below the names of all qualified subcontractors or suppliers he will employ for the various portions of the work indicated. If the bidder does not find an appropriate listing below for any additional trades or subcontractors he is using he may add that trade/subcontractor to the list below. Failure on the part of the bidder to properly complete this form and list all of the trades/subcontractors he intends to use on this project will constitute sufficient grounds to reject his bid.

The bidder may list himself to perform any category of work that he will accomplish with his own forces.

UTILITIES.....
CONCRETE.....
MASONRY
CARPENTRY
METAL FRAMING
INSULATION
STOREFRONT/GLASS & GLAZING
DOORS NAD FRAMES.....
HARDWARE.....
GYPSUM DRYWALL
FLOOR COVERING
CERAMIC TILE.....
ACOUSTICAL CEILINGS.....
PAINTING
CASEWORK.....
ROOFING.....
AUTOMATIC FIRE SPRINKLER SYSTEM.....
TOILET COMPARTMENTS / TOILET ACCESSORIES

MECHNICAL WORK
PLUMBING WORK
ELECTRICAL WORK
LOW VOLTAGE WORK
AUTOMATIC FIRE ALARM SYSTEM
GUTTER AND DOWNSPOUT DE-ICING.....

Signed: _____
(Contractor)

DOCUMENT 00 43 25

**SUBSTITUTION REQUEST FORM
(During Procurement)**

Project: Improvements for Athletic Complex
Buildings 80 & 83

To: W. Alan Kenson & Associates, P.C.
P.O. Box 11593
Prescott, AZ 86304

Substitution Request Number: _____
From: _____
Date: _____
A/E Project Number: 653

Specification Title: _____ Description: _____
Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution: _____

Manufacturer: _____ Address: _____ Phone: _____

Trade Name: _____ Model No.: _____

Attached data includes sufficient information, descriptive brochures, drawings, performance and test data, samples or other data as is necessary for complete evaluation and indicates by direct comparison how the proposed substitution differs from that specified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation. ***The Contractor shall provide for redesign necessitated by the substitution.***

The Undersigned certifies:

- 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 by the substitution.

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

Telephone: _____

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ _____

A/E's REVIEW AND ACTION

- ☐ Substitution approved (Include in Addendum).
- ☐ Substitution approved as noted (Include in Addendum with notation).
- ☐ Substitution rejected due to lack of information.
- ☐ Substitution rejected due to evaluation that it is not equivalent to specified product.
- ☐ Substitution Request received too late.

Signed by: _____ Date: _____

SECTION 00 61 13

PERFORMANCE AND PAYMENT BOND

AIA Document A312 – 2010 is hereby incorporated into and made part of these Contract Documents the same as if bound herein in full.

END OF SECTION

DOCUMENT 00 63 13

REQUEST FOR INTERPRETATION FORM

Project:	Improvements for Athletic Complex Buildings 80 & 83	R.F.I. Number:	_____
		From:	_____
To:	W. Alan Kenson & Associates, P.C. P.O. Box 11593 Prescott, AZ 86304	Date:	_____
		A/E Project Number:	653

Specification Section:	Paragraph:	Drawing Reference:	Detail

Request:

* Requested Date/Time for Response:

Signed by:

Response:

Attachments

Response From:	To:	* Date Rec'd:	* Date Ret'd:

Signed by: _____

Copies:	Owner	Consultants	_____	_____	_____	File

* Contractor shall allow up to 5 working days review and response time for RFI'S, unless review is required of multiple consultants, then the review and response period shall be 7 working days. (See Section 01 26 13.

SECTION 00 63 25

**SUBSTITUTION REQUEST
(After the Bidding Phase)**

Project: Improvements for Athletic Complex Substitution Request Number: _____
Buildings 80 & 83 From: _____
To: W. Alan Kenson & Associates, P.C. Date: _____
P.O. Box 11593 A/E Project Number: 653
Prescott, AZ 86304
Re: _____ Contract For: _____

Specification Title: _____ Description: _____
Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution: _____
Manufacturer: _____ Address: _____ Phone: _____
Trade Name: _____ Model No.: _____
Installer: _____ Address: _____ Phone: _____
History: ☐ New product ☐ 2-5 years old ☐ 5-10 years old ☐ More than 10 years old
Differences between proposed substitution and specified product: _____

☐ Point-by point comparative data attached – REQUIRED BY A/E

Reason for not providing specified item: _____

Similar Installation:

Project: _____ Architect: _____
Address: _____ Owner: _____
_____ Date Installed: _____

Proposed substitution affects other parts of Work: ☐ No ☐ Yes; explain _____

Savings to Owner for accepting substitution: _____ (\$_____).

Proposed substitution changes Contract Time: ☐ No ☐ Yes [Add] [Deduct] _____ days.

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ _____

The Undersigned certifies:

- 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.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- 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 by the substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Submitted by: _____
Signed by: _____
Firm: _____
Address: _____
Telephone: _____
Attachments: _____

A/E's REVIEW AND ACTION

- ☐ Substitution approved – Make submittals in accordance with Specification Section 01 33 00.
- ☐ Substitution approved as noted – Make submittals in accordance with Specification Section 01 33 00.
- ☐ Substitution rejected – Use specified materials.
- ☐ Substitution Request received too late – Use specified materials.

Signed by: _____ Date: _____

Additional Comments: ☐ Contractor ☐ Subcontractor ☐ Supplier ☐ Manufacturer ☐ A/E ☐ _____



AIA® Document A101™ – 2007

Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum

AGREEMENT made as of the ____ day of _____ in the year 20____
(In words, indicate day, month and year.)

BETWEEN the Owner:
(Name, legal status, address and other information)

Embry-Riddle Aeronautical University, Inc.
600 S. Clyde Morris Blvd.
Daytona Beach, Florida 32114-3900

and the Contractor:
(Name, legal status, address and other information)

for the following Project:
(Name, location and detailed description)

The Architect:
(Name, legal status, address and other information)

Notwithstanding anything in the Contract Documents to the contrary, with respect to the contract administration services to be provided by the Architect under the terms of the Contract Documents, any references to the term Architect shall be deemed to mean the Architect, or at Owner's sole discretion, the Owner or a duly designated representative of the Owner as such representative may be identified in writing by Owner from time to time.

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

AIA Document A201™–2007, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

Init.

TABLE OF ARTICLES

1	THE CONTRACT DOCUMENTS
2	THE WORK OF THIS CONTRACT
3	DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION
4	CONTRACT SUM
5	PAYMENTS
6	DISPUTE RESOLUTION
7	TERMINATION OR SUSPENSION
8	MISCELLANEOUS PROVISIONS
9	ENUMERATION OF CONTRACT DOCUMENTS
10	INSURANCE AND BONDS

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be the date of this Agreement unless a different date is stated below or provision is made for the date to be fixed in a notice to proceed issued by the Owner.

(Insert the date of commencement if it differs from the date of this Agreement or, if applicable, state that the date will be fixed in a notice to proceed.)

The date of commencement will be established in the notice to proceed to be issued by Owner.

If, prior to the commencement of the Work, the Owner requires time to file mortgages and other security interests, the Owner's time requirement shall be as follows:

§ 3.2 The Contract Time shall be measured from the date of commencement.

§ 3.3 The Contractor shall achieve Substantial Completion of the entire Work as follows [CHOOSE ONE]:

(Insert number of calendar days. Alternatively, a calendar date may be used when coordinated with the date of commencement. If appropriate, insert requirements for earlier Substantial Completion of certain portions of the Work.)

☐ not later than ____ days from the date of commencement;

Init.

☐ by the calendar date of _____, 20____;
☐ by the date of Substantial Completion shown on the Construction Schedule attached as Exhibit A; OR
☐ as follows: _____.

Portion of Work

Substantial Completion Date

, subject to adjustments of this Contract Time as provided in the Contract Documents.

(Insert provisions, if any, for liquidated damages relating to failure to achieve Substantial Completion on time or for bonus payments for early completion of the Work.)

§ 3.3.1 Owner and Contractor agree that time is of the essence and that Owner will suffer financial loss if the Work is not substantially completed within the Contract Time, as said Contract Time may be adjusted as provided for herein.

In such event, the total amount of the Owner's damages, will be difficult, if not impossible, to definitely ascertain and quantify. It is hereby agreed by the parties that it is appropriate and fair that the Owner receive liquidated damages from the Contractor as Owner's sole and exclusive remedy for all delay related damages, if the Contractor fails to achieve Substantial Completion of the Work within the required Contract Time. Should Contractor fail to substantially complete the Work within the required time period, Owner shall be entitled to assess, as liquidated damages, but not as a penalty, \$ _____ for each calendar day thereafter until Substantial Completion is achieved; provided, however, said liquidated damages shall not begin to accrue until 21 days after Contractor should have achieved Substantial Completion. Contractor hereby expressly waives and relinquishes any right which it may have to seek to characterize the above noted liquidated damages as a penalty, which the parties agree represents a fair and reasonable estimate of Owner's actual damages at the time of contracting if Contractor fails to substantially complete the Work in a timely manner.

3.4 Attached hereto and made a part hereof as Exhibit A is the Contractor's initial Construction Schedule.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be _____ (\$ _____), subject to additions and deductions as provided in the Contract Documents.

§ 4.2 The Contract Sum is based upon the following alternates, if any, which are described in the Contract Documents and are hereby accepted by the Owner:

(State the numbers or other identification of accepted alternates. If the bidding or proposal documents permit the Owner to accept other alternates subsequent to the execution of this Agreement, attach a schedule of such other alternates showing the amount for each and the date when that amount expires.)

N/A

§ 4.3 Unit prices, if any:

(Identify and state the unit price; state quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price Per Unit (\$0.00)
N/A		

§ 4.4 Allowances included in the Contract Sum, if any:

(Identify allowance and state exclusions, if any, from the allowance price.)

Item	Price
N/A	

ARTICLE 5 PAYMENTS

§ 5.1 PROGRESS PAYMENTS

§ 5.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

Init.

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User Notes:

(1649822320)

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

§ 5.1.3 Provided that a properly completed Application for Payment is received by the Architect not later than the tenth day of a month, the Owner shall make payment of the certified amount to the Contractor not later than the tenth day of the following month. If an Application for Payment is received by the Architect after the application date fixed above, payment shall be made by the Owner as part of the next month's Application for Payment.
(Federal, state or local laws may require payment within a certain period of time.)

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form and supported by such data to substantiate its accuracy as the Owner or Architect may require. This schedule, unless objected to by the Owner or Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Attached hereto and made a part hereof as Exhibit B is the initial approved schedule of values. Notwithstanding anything in the Contract Documents to the contrary, if at any time either the Architect or the Owner determine that the schedule of values no longer reflects a reasonable and balanced allocation of the Contract Sum among the various items and categories of Work, Contractor shall be required to revise the schedule of values as directed by Architect or Owner.

§ 5.1.5 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.6 Subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

- .1 Take that portion of the Contract Sum properly allocable to completed Work as determined by multiplying the percentage completion of each portion of the Work by the share of the Contract Sum allocated to that portion of the Work in the schedule of values, less retainage of ten percent (10 %). Pending final determination of cost to the Owner of changes in the Work, amounts not in dispute shall be included as provided in Section 7.3.9 of AIA Document A201™–2007, General Conditions of the Contract for Construction;
- .2 Add that portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction (or, if approved in advance and in writing by the Owner, suitably stored off the site at a location agreed upon in writing), less retainage of ten percent (10 %);
- .3 Subtract the aggregate of previous payments made by the Owner; and
- .4 Subtract amounts, if any, for which either the Owner or the Architect has withheld or nullified a Certificate for Payment as provided in Section 9.5 of AIA Document A201–2007.

§ 5.1.7 The progress payment amount determined in accordance with Section 5.1.6 shall be further modified under the following circumstances:

- .1 Add, upon Substantial Completion of the Work, a sum sufficient to increase the total payments to the full amount of the Contract Sum, less two hundred percent (200%) of the value of any incomplete Work and unsettled claims, as determined by Architect and Owner; and
(Section 9.8.5 of AIA Document A201–2007 requires release of applicable retainage upon Substantial Completion of Work with consent of surety, if any.)
- .2 Add, if final completion of the Work is thereafter materially delayed through no fault of the Contractor, any additional amounts payable in accordance with Section 9.10.3 of AIA Document A201–2007.

§ 5.1.8 Reduction or limitation of retainage, if any, shall be as follows:

(If it is intended, prior to Substantial Completion of the entire Work, to reduce or limit the retainage resulting from the percentages inserted in Sections 5.1.6.1 and 5.1.6.2 above, and this is not explained elsewhere in the Contract Documents, insert here provisions for such reduction or limitation.)

N/A

Init.

§ 5.1.9 Except with the Owner's prior written approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.2 FINAL PAYMENT

§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

- .1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Section 12.2.2 of AIA Document A201-2007, and to satisfy other requirements, if any, which extend beyond final payment; and
- .2 a final Certificate for Payment has been issued by the Architect.

§ 5.2.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the Architect's final Certificate for Payment, or as follows:

§5.3 CONDITIONS FOR PAYMENT.

§ 5.3.1 An amount not to exceed: (1) two hundred percent (200%) of the Owner's liability associated with defective or damaged Work not remedied by Contractor, and (2) two hundred percent (200%) of claims filed by laborers, materialmen, and/or Subcontractors under this Agreement will not be payable or due at the option of the Owner until such time as Contractor has rectified the condition to the full satisfaction of the Owner.

§ 5.3.2 With each Application for Payment relating to any Progress Payments, Contractor shall provide the following: (1) unconditional waivers and releases of liens from itself and all Subcontractors, suppliers and materialmen associated with the Work; and (2) to the extent any portion of Contractor's compensation is based upon reimbursable costs incurred by Contractor, verification to the reasonable satisfaction of the Owner that the costs contained in that Application for Payment have been incurred by Contractor. Further, with the Contractor's final Application for Payment, Contractor shall provide the following: (1) unconditional final waivers and releases of liens from all Subcontractors, suppliers and materialmen associated with the Work; (2) to the extent any portion of Contractor's compensation is based upon reimbursable costs incurred by Contractor, verification to the reasonable satisfaction of the Owner that the costs contained in the final Application for Payment have been incurred by Contractor; and (3) Contractor's Final Payment Affidavit and Contractor's unconditional final waiver and release of lien. In the absence of any such waivers or verifications, the Owner, at its sole option, may withhold all or any portion of funds otherwise due the Contractor to protect Owner from loss.

§ 5.3.3 Contractor agrees to keep the Project and premises free and clear from all construction liens and all other constitutional, statutory, and common-law liens, garnishments, and encumbrances arising out of or relating to the Work (the "Lien Claims"). If any Lien Claims are filed or recorded relating to the Project or premises, so long as such Lien Claim is not the result of Owner's failure to make a payment properly due Contractor under the Contract Documents, to the maximum extent permitted by law, Contractor shall defend, indemnify and hold Owner harmless against said Lien Claims at Contractor's sole cost. If any such Lien Claim is filed, Contractor within five (5) business days of receiving notice of such Lien Claim shall pay, bond off, or otherwise discharge said Lien Claim and furnish proof to Owner. If Contractor fails to do so within said five (5) business days, then Owner may take any action it deems appropriate to discharge such Lien Claim on Contractor's behalf and charge the cost thereof against Contractor, and in addition to any other remedies it may have under this Contract or at law, Owner may retain sufficient funds out of any money then due or thereafter to become due Contractor and pay the same and all costs incurred by reason thereof, including reasonable attorneys' fees, paralegals' fees and court costs. Owner, upon receipt of a notice that a Lien Claim by any Subcontractor or vendor pertaining to the Work, has the right to make payment jointly to the Contractor and such Subcontractor or vendor.

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 INITIAL DECISION MAKER

The Architect will serve as Initial Decision Maker pursuant to Section 15.2 of AIA Document A201-2007, unless the parties appoint below another individual, not a party to this Agreement, to serve as Initial Decision Maker.

Init.

(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

§ 6.2 BINDING DISPUTE RESOLUTION

For any Claim subject to, but not resolved by, mediation pursuant to Section 15.3 of AIA Document A201–2007, the method of binding dispute resolution shall be as follows:

(Check the appropriate box. If the Owner and Contractor do not select a method of binding dispute resolution below, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.)

- ☒ [X] Arbitration pursuant to Section 15.4 of AIA Document A201–2007
- ☐ [] Litigation in a court of competent jurisdiction
- ☐ [] Other *(Specify)*

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2007.

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2007.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2007 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.
(Insert rate of interest agreed upon, if any.)

Six percent (6%) per annum

§ 8.3 The Owner's representative:
(Name, address and other information)

§ 8.6.1 Notwithstanding anything in the Contract Documents to the contrary, it is expressly acknowledged and agreed by Contractor that no director, officer, employee or member of Owner shall have any personal liability under this Agreement and, as a material inducement for Owner to enter into this Agreement, Contractor hereby expressly waives and releases any and all such personal liability. Contractor acknowledges and agrees that its only recourse for any liability or obligation of Owner hereunder shall be against the Owner and the Project.

§ 8.6.2 Any notices required or permitted under the Contract Documents shall be deemed fully given if placed in a prepaid addressed envelope and sent by certified U.S. Mail with return receipt requested or by Federal Express or other similar national express mail service, or by delivering the same in person. Any such notice shall be effective upon three days after the notice is sent or upon receipt whichever is earliest. All notices to be given to the parties shall be sent to or made at the addresses as set forth below; but by giving the other party at least 10 days prior written notice thereof, the parties hereto shall have the right to change their respective addresses or to whom the notices are to be sent.

Notices to Owner:

with copy to:

Notice to Contractor

with copy to:

§ 8.6.3 A failure to assert any rights or remedies available to a party under the terms of the Contract, or a waiver of the right to remedies available to a party by a course dealing or otherwise shall not be deemed to be a waiver of any other right of remedy under the Contract, unless such waiver of such right or remedy is contained in a writing signed by the party alleged to have waived his other rights or remedies.

§ 8.6.4 Contractor agrees to comply, at its own expense, with all federal, state and local laws, codes, statutes, ordinances, rules, administrative orders, regulations and requirements applicable to the Project, including but not limited to those dealing with safety. If Contractor observes that the Contract Documents are at variance therewith, it shall promptly notify Owner and Architect in writing.

§ 8.6.5 In addition to any other right or remedy available to the Owner under the Contract Documents, if the Contractor's performance of the Work falls behind the approved Construction Schedule due to reasons attributable to Contractor, the Owner may withhold any and all payments that may be then due and owing Contractor, until such time as Contractor's performance of the Work under the approved Construction Schedule has been restored to Owner's complete satisfaction.

§ 8.6.6 Performance and Payment Bonds ("Bonds") [☒] are or [☐] are not [CHOOSE ONE] required to be provided by Contractor. If Bonds are required, then prior to the start of any Work at the Project site and in no event later than five (5) business days after the execution of this Contract by Owner and Contractor, Contractor shall deliver to Owner the Bonds in the amount of 100% of the Contract Sum. The costs of such Bonds are included in the Contract Sum. The Bonds shall be provided on forms and by a surety reasonably acceptable to Owner.

§ 8.6.7 Notwithstanding anything hereto to the contrary, Owner shall be entitled to withhold from any amount due Contractor hereunder or due under any other contract between Owner and Contractor any sums which may be owed Owner by Contractor either under this Contract or any other contract between Owner and Contractor. Further, at Owner's sole election, any default by Contractor under this Contract shall be deemed a default by Contractor under any other agreement between the parties and a default by Contractor under any other agreement between the parties shall be deemed a default by Contractor under this Contract. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall immediately pay the difference to the Owner.

§ 8.6.8 Owner Direct Purchase: Notwithstanding anything herein to the contrary, because Owner is exempt from sales tax and wishes to generate sales tax savings for the Project, Owner reserves the right to make direct purchases of various construction materials and equipment included in the Work. Contractor will submit invoices in excess of

Init.

\$5,000 for services and/or construction materials to Owner, and Owner will issue Purchase Orders and payment for materials and/or services directly to the material supplier or servicer. The amount of said charges will be deducted from the value of the Contract by a deductive Change Order submitted from Contractor to Owner. With respect to all direct purchases by Owner, Contractor shall remain responsible for coordinating, ordering, inspecting, accepting delivery, storing, handling, installing, warranting and quality control for all direct purchases. Notwithstanding anything herein to the contrary, Contractor expressly acknowledges and agrees that any materials or equipment directly purchased by Owner pursuant this Paragraph 8.6.8 shall be included within and covered to the same extent as all other warranties provided by Contractor pursuant to the terms of the Contract Documents. Owner shall assign to Contractor any and all warranties and rights Owner may have from any manufacturer or supplier of any such direct purchases by Owner.

§ 8.4 The Contractor's representative:
(Name, address and other information)

§ 8.5 Neither the Owner's nor the Contractor's representative shall be changed without ten days written notice to the other party.

§ 8.6 Other provisions:

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 The Contract Documents, except for Modifications issued after execution of this Agreement, are enumerated in the sections below.

§ 9.1.1 The Agreement is this executed AIA Document A101-2007, Standard Form of Agreement Between Owner and Contractor.

§ 9.1.2 The General Conditions are AIA Document A201-2007, General Conditions of the Contract for Construction, as modified by the parties.

§ 9.1.3 The Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages
N/A			

§ 9.1.4 The Specifications:
(Either list the Specifications here or refer to an exhibit attached to this Agreement.)

Section	Title	Date	Pages
See Exhibit C			

§ 9.1.5 The Drawings:
(Either list the Drawings here or refer to an exhibit attached to this Agreement.)

Number	Title	Date
See Exhibit C		

Init.

§ 9.1.6 The Addenda, if any:

Number	Date	Pages
N/A		

Portions of Addenda relating to bidding requirements are not part of the Contract Documents unless the bidding requirements are also enumerated in this Article 9.

§ 9.1.7 Additional documents, if any, forming part of the Contract Documents:

- .1 AIA Document E201™–2007, Digital Data Protocol Exhibit, if completed by the parties, or the following:
- .2 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201–2007 provides that bidding requirements such as advertisement or invitation to bid, Instructions to Bidders, sample forms and the Contractor's bid are not part of the Contract Documents unless enumerated in this Agreement. They should be listed here only if intended to be part of the Contract Documents.)

Exhibit A – Construction Schedule
Exhibit B – Schedule of Values
Exhibit C – Specifications
Exhibit D – Standard Labor Rates
Exhibit E – Staffing Schedule

ARTICLE 10 INSURANCE AND BONDS

The Contractor shall purchase and maintain insurance and provide bonds as set forth in Article 11 of AIA Document A201–2007.

(State bonding requirements, if any, and limits of liability for insurance required in Article 11 of AIA Document A201–2007.)

Type of insurance or bond	Limit of liability or bond amount (\$0.00)
See below	

CONTRACT INSURANCE REQUIREMENTS

The contractor shall procure, maintain and provide evidence of the following insurance coverages during the life of this contract, in such form and with such carriers as approved by the University, at the contractor's sole expense.

- (1) The following minimum coverages and limits are required:
 - (a) **COMPREHENSIVE GENERAL LIABILITY** including, but not limited to, the following coverages: professional, premises/operations, products/completed operations, contractual, personal injury, broad form property damage and fire legal liability (\$1,000,000).

Bodily Injury and Property Damage	\$ 1,000,000 each occurrence
(Combined Single Limit)	\$ 1,000,000 aggregate
 - (b) **COMPREHENSIVE AUTOMOBILE LIABILITY** including owned, hired and non-owned automobile coverages.

Bodily Injury and Property Damage	\$ 1,000,000 each occurrence
(Combined Single Limit)	\$ 1,000,000 aggregate

Init.

The contractor shall certify that such insurance is carried on vehicles of any subcontractor or supplier that makes delivery to the University.

(c) **WORKER'S COMPENSATION** (Including Employers Liability) as required by State law for all of the contractor's employees engaged in work at the University.

- (2) Insurance certificates indicating the required coverages shall be furnished to the University for approval throughout the term of the contract and for one year after the contract ends.
- (3) These policies of insurance shall name "Embry-Riddle Aeronautical University, Inc." as additional insured with respect to operations performed under this contract, protecting the insured and the University as though a separate policy had been issued to each. These policies shall be primary and shall not require contribution from any insurance carried by the University.
- (4) These policies shall contain a provision requiring thirty (30) days written notice of cancellation to the University before cancellation, reduction or other modification of coverage may become effective.
- (5) At any time during contract performance and upon request of the University, the contractor shall provide the University certified true copies of these policies and any changes thereto.
- (6) In the event that the contractor fails to maintain and keep in force the insurance as provided herein, the University shall have the right to cancel and terminate this contract forthwith and without notice.

This Agreement entered into as of the day and year first written above.

OWNER:
EMBRY-RIDDLE AEORONAUTICAL
UNIVERSITY, INC., a Florida non-profit corporation

CONTRACTOR:

a _____

(Table deleted)

Name: _____
Title: _____

Name: _____
Title: _____

DOCUMENT 00 70 00
GENERAL CONDITIONS

The General Conditions of the Contract for Construction, AIA Document A201-2007, hereafter referred to as General Conditions, are hereby incorporated into and made part of these Contract Documents the same as if bound herein in full. A copy of the referenced document is available for inspection at the office of the Architect.

END OF SECTION

EXHIBIT I

Architectural & Engineering Design Standards

Prescott Campus University Construction & Planning



EMBRY-RIDDLE
Aeronautical University

Date: 9/01/05

Revised: 01/16/14

Architectural & Engineering Design Standards Prescott Campus

Abbreviations:

PM – ERAU Project Manager Budget Office

U. N. O. – Unless Noted Otherwise

Division 1 – General Data

Section 0100 - General Guidelines

Division 2 – Site Construction

Section 02441 - Irrigation

Section 02500 - Fencing / Outdoor Accessories

Section 02900 - Landscaping

Hardscape

Division 3 – Concrete

Division 4 – Masonry

Division 5 – Metals

Division 6 – Wood and Plastics

Section 06100 – Rough Carpentry

Section 06200 – Finish Carpentry

Section 06240 – Plastic Laminates

Section 06420 – Custom Casework

Division 7 – Thermal and Moisture Protection

Section 07100 – Waterproofing

Section 07200 – Insulation

Section 07212 – Board Insulation

Section 07412 – Metal Roofing & Siding

Section 07460 – Rain Gutters & Leaders

Section 07500 – Membrane Roofing

Division 8 – Doors and Windows

Section 08110 – Steel Doors & Frames

Section 08200 – Wood and Plastic Doors & Frames

Section 08410 – Aluminum Entrances and Storefronts

Section 08420 – Steel Entrances and Storefronts

Section 08500 – Metal Windows

Section 08710 – Hardware

Division 9 – Finishes

Section 09251 – Gypsum Wallboard

Section 09580 – Suspended Decorative Grids

Section 09630 – Masonry Flooring

Section 09650 – Resilient Flooring and Accessories

Section 09685 – Carpet

Section 09900 – Painting

Section 09950 – Wall Covering

Division 10 – Specialties

Section 10150 – Toilet Compartments

Section 10100 – Visual Display Boards

Section 10260 – Wall and Corner Guards

Section 10400 – Identifying Devices

Section 10520 – Fire Protection Specialties
Section 10800 – Toilet & Washroom Accessories

Division 11 – Equipment

Section 11130 – Audio Visual Equipment

Division 12 – Furnishings

Section 12500 – Window Coverings (Curved PVC)
Section 12670 – Rug & Mats

Division 13 – Special Construction

Section 13825 – Security Systems
Section 13835 – Elevator Monitoring Control System
Section 13845 – Alarm Detection Systems
Section 13850 – Door Control Systems
Section 13900 – Fire Suppression and Supervisory Systems

Division 14 – Conveying Systems

Section 14200 – Elevators

Division 15 – Mechanical

Section 15010 – General
Section 15300 – Fire Sprinkler Criteria
Section 15410 – Plumbing Fixtures (and accessories)
Section 15500 – HVAC
Section 15850 – Air Handling
Section 15860 – Centrifugal Fans

Division 16 – Electrical

Section 16000 – General
Section 16140 – Wiring Devices
Section 16050 – Basic Electrical Materials and Methods – Conduits
Section 16300 – High Voltage Distribution (above 600 volts)
Section 16320 – Transformers
Section 16400 – Service & Distribution (600 volts and below)
Section 16420 – Service Entrance
Section 16480 – Motor Control
Section 16490 – Low-Voltage Distribution Components and Accessories
Section 16500 – Lighting
Section 16501 – Lamps
Section 16502 – Ballasts & Accessories
Section 16530 – Site lighting

Special Note for all Contractors: Hazardous Materials are used on this campus.

All ERAU Contractors have the right and obligation to read about these materials before using them or being exposed to them.

- Material Safety Data Sheets (MSDS) are on file in the Occupational Safety & Health (OSH) Program Manager's Office.
- Copies of this program are maintained at each Department/Area, and also in Building F3, the (OSH) Program Manager's Office.
- An MSDS should be on file for each chemical or hazardous material used.
- If you become aware of a situation where an MSDS is not on file, please tell us immediately so that we can order it and have it available to you.
- Take time to review the MSDS file.
- Know the hazards and characteristics of every material you use.
- Contractors: Should there be Hazardous Materials used by your company at any University work site, MSDS's must to be provided to the University prior to work commencing.

DIVISION 1 - GENERAL DATA

Section 01100 - GENERAL GUIDELINES

1. 00 General Requirements

- A. These standards are for the guidance of Architects, Engineers and Contractors in the technical design of new buildings and additions to buildings. They are minimum standards. Actual design should be consistent with the overall program, building quality and scope of project. The design should be in context with and in harmony with the existing buildings on campus, with sensitivity to the surrounding pallet of materials and colors.
- B. These standards convey owner expectations and requirements and outline specific products and components that the University has standardized for use on all construction projects. Incorporation of these products facilitates efficient and cost-effective operations and is based on a history of successful use. Specification of these products, and adherence to design standards, is expected to expedite the design process, avoid costly change orders, and ensure that the project can be constructed within budget.
- C. Embry-Riddle (ERAU) has experienced the installation of obsolete components of manufacturers without local vendor representation, making it difficult (and in some cases impossible) to obtain replacement parts. Components accepted for installation must be of the latest production model running line, with spare parts readily obtainable.
- D. If the Architect and/or the Engineer desires to make any exceptions to the Design Standards, written approval from the University Prescott Campus Project Manager (PM) must be obtained. Electronic mail communication to request the exceptions is acceptable.
- E. ERAU's standardized Wiring Requirements for Information Technology including telephone, data, fiber optic, computers and telephone/I. T. rooms are available in Exhibit II: Standardized Wiring Requirements.
- F. All architects, engineers and contractors are contractually required to comply with these standards or provide a written request and information regarding an, or equal substitute. The Standards must be reflected in the design documents. ERAU will not accept any proprietary vendors, unless written approval is received from the PM before design has been completed.
- G. All subcontractors to provide Embry-Riddle with a final Operation and Maintenance Manual listing manufacturer name and model # for each part used in their portion in lieu of excess stock, unless otherwise noted in the sections below.
- H. All Contractor's (General or otherwise) and Sub-Contractor's of General Contractor's or otherwise, employed through Embry-Riddle Aeronautical University (ERAU) to perform construction work on the Main Campus at 3700 Willow Creek Road, Prescott, AZ or at the Flight Training Center (FTC) at the Love Field Airport Location are to note:

The facilities & grounds located, as described above, are regulated within the scope of safety regulations governed by the Occupational Safety & Health Act within CFR 29 1910, General Industry Regulations and incorporated into the ERAU comprehensive safety policies. Paragraph 1910. 12 (Construction Work) adopts the standards prescribed in CFR Part 1926 as Occupational Safety & health standards under section 6 of the Act and shall apply, according to the provisions thereof, to every employment and place of employment of every employee engaged in construction work. Each employer shall protect the employment and places of employment of each of his employees engaged in construction work by complying with the appropriate standards prescribed in this paragraph. Thus, the standards (substantive rules) published in Subpart C and the following subparts of Part 1926 of this chapter are applied.

1. 02 Drawing Standards

- A. Each set of drawings shall satisfy the following minimum requirements:
 - 1. Provide a key map and key plans to show the location of the work site.
 - 2. Provide sufficient information to enable the contractor to determine from the drawings alone the total quantities of all materials and equipment required to execute the work.
 - 3. Locate all equipment, piping, and ductwork accurately and free of interference with all other building components.
 - 4. Present plans of all trades with the same orientation.

5. Present all information in any orderly manner, legible, and consistent with the highest professional standards.
 6. Provide plans for International Building Code and Life Safety Code approval. Plans will clearly show exit paths and the measured distances to exits and all fire rated wall conditions.
 7. Have imprinted on each sheet the registration seal and legal signature of the registered professional architect or engineer who is responsible for designs and who retains all calculations.
- B. Drawing Medium:
1. Plot all drawings to the same sheet size for all trades.
 2. The Project title and record date will be the same on all sheets.
 3. All drawings shall be produced in AutoCAD and be prepared by trained AutoCAD operators.
 4. Layers to follow the AIA CAD Layer Guidelines as published in the United States National Cad Standards Manual.
 5. Drawings to be numbered per the Uniform Drawing System - Drawing Set Organization as published in the United States National Cad Standards Manual.
 6. Incorporate the Drawing number into the AutoCAD file name for each drawing.
- C. Line Work:
1. Line widths shall be graded for identification purposes from very thin (hatching patterns) to wide (elements cut in horizontal or vertical sections) using a consistent pattern.
- D. Lettering:
1. Lettering, as printed, shall not be smaller than 1/8" in height (12" for 1/8" scale, 6" for 1/4" scale, 3" for 1/2" scale, etc.)
- E. Scales:
1. Floor plans shall be drawn at not less 1/8" = 1' - 0". Enlarged detail plans (bathrooms, mechanical rooms, etc.) at not less than 1/4" = 1' - 0", preferably at 1/2" = 1' - 0".
 2. Indicate the scale used under each drawing or note as not to scale.
- F. Symbols and Abbreviations:
1. Indicate the complete set of the symbols and abbreviations used for each discipline on the General Drawings.
- G. Site Plan:
1. Show all outside piping and mechanical equipment on the architectural site plan. If necessary, repeat this information on separate engineering site plans for clarity.
- H. Floor Plans:
1. Show all fixtures and equipment on the plans.
 2. All room and space numbers to be approved by ERAU prior to distribution to Architect's design professionals.
 3. On the Reflected Ceiling Plan show all light fixtures, including exit signs and emergency lights, HVAC supply and return grilles, sprinkler heads, and audio and video equipment.
 4. ERAU to provide Furniture Plans as needed to Architect.
- I. Roof Plan:
1. Show all equipment, piping, and any ductwork located on roof. Show all roof penetrations and provide appropriate details of each type condition. Use standard details of the National Roofing Contractors Association (N. R. C. A.).
- J. Building Sections:
1. Indicate all building components including ductwork and piping.
 2. In spaces such as ceiling spaces above hallways or any other space where HVAC ductwork or piping is located, show the location and elevation of each trade's work. 908
- K. Isometrics, Schematic Diagrams, Typical and Special Details:

1. Use to clarify plan and section views.

1. 03 Document Review and Archival Documents

A. Construction Document Review

1. At 100% Schematic Design Documents submit the following:
 - a. Two full size sets of the Drawings for review and comments by ERAU.
 - b. Two sets of the Project Manual.

2. At 100% Design Documents submit the following:
 - a. Two full size sets of the Drawings for review and comments by ERAU.
 - b. Two sets of the Project Manual.
 3. At approximately 95 % - 100% completion of Construction Documents submit the following:
 - a. Five full size sets of the Drawings for final review and comments by ERAU.
 - b. Five sets of the Project Manual.
- B. Archival Documents
1. At the time the Letter to Proceed is given to the Contractor, provide a CD-ROM with all addendums added to the drawing set. All AutoCAD drawings of the bid documents. All cad drawings shall be whole and complete with NO X refs to symbols or other drawings. The format of the CAD file shall be AutoCAD DWG or DXF. No other format will be accepted.
 2. At the completion of the Work, Contractor shall submit the following:
 - a. One hard copy set of As-Built Drawings showing all changes made to the building and utility line locations during construction:
 - b. Provide a second CD-ROM with all change orders and as-built changes. All cad drawings shall be whole and complete with NO X refs to symbols or other drawings. The format of the CAD file shall be Auto-cad DWG or DXF. No other format will be accepted.
 - c. Three ring binders containing the Project Manual including all Addenda and authorized Change Orders.
 - d. Three copies of all Operational Manuals, Shop Drawings, Product Data and Schedules.
 - e. One three ring binder containing all approved interior finish material submittals and samples.
 - f. One copy of the General Contractor's contact directory of all subcontractors and suppliers who worked on the Project.
 - g. Any additional record documents required per the Project Manual.

1. 04 Typical Program Requirements, See Specific Building Program Requirements generated by PM

- A. Building Design and Circulation:
1. All building entrance doors must be locked to entry from the exterior, and never locked to exit from the interior per the exit requirements of the Building Code. Main entrance doors to have security card readers and electric strikes. All exterior doors to be monitored.
 2. Provide access to all building service closets from common public corridors or the exterior.
 3. IT service closets must be isolated from all other service closets.
 4. Open Office areas should be configured in suites and have locked and/or card reader door security.
 5. Verify the fire rating of walls enclosing mechanical & electrical systems. Specify in architectural documents that all fire rated assembly work to be sealed with an approved fire stop foam at all wall and floor penetrations by pipes, conduits, ducts, etc. Specify fire rated walls to have fire rating notice stenciled above ceiling line per Building Code.
 6. Coordinate locations for recessed fire extinguisher cabinets, emergency lighting and exit signs. Fire extinguisher units to be approved by Campus Fire Marshal. Fire extinguisher cabinets to be installed at 32" AFF to the bottom of the cabinet, max 54" AFF to controls.
 7. The color of all wall and ceiling mounted fire alarm devices to be white or off-white with red lettering. The color of the lettering of all exit signs to be red. Braille ADA compliant exit signs shall be white on black.
 8. Ceiling plenums must have adequate clearances for ductwork and other building system components. Corridor ceiling height to be a minimum of 8'-0" clear.
 9. Provide adequate custodial closets and custodial storage rooms. Each custodial closet to have a floor mop sink and space for owner supplied shelving and mop holders. All custodial closets to have an out swinging door. Floor finish to be sealed concrete when possible. FRP wainscot all walls.
 10. Buildings with laboratories may require areas for handling the delivery and return of gas bottles. Provide empty bottle holding areas including chain restraints.
 11. On each floor adjacent to vending areas and break rooms provide an area 25 square feet in size for recycling container and trash receptacles.
 12. EM egress stair design:

- a. In buildings with concrete structure, stairs to be sealed concrete, no paint. In buildings with steel structure, stairs to be concrete filled pan treads with closed risers. Floor to be protected during construction.
- b. Stair riser and tread dimensions to be designed per Building Code requirements.
- c. Provide non-slip nosing's on all stair treads. Not to be painted.
- d. Provide roof access from at least one stair. Access hatch to be secured with a deadbolt lockset.
- e. Stairs used for frequent communication may have upgraded finishes, i.e. rubber treads, with maintenance considerations a priority.
- 13. Provide separate sleeves under walks and roadways for future power, lighting, communication and irrigation lines. Sleeves shall be 4" minimum in size.
- 14. Exterior grades shall slope away from buildings and the building floor elevation must be high enough to prevent rainwater from entering the building at any door.
- 15. Separate utility meters will be installed for each utility on all new building projects.
- B. Building Donor Recognition:
 - 1. When buildings or portions of buildings are to be identified for donor recognition, signage, recognition plaques, *et al*, shall conform to standards adopted by ERAU.
- C. Roof design: Minimum roof slope for shingled roofs is 3:12.
 - 1. There will be an overhang above all windows and doors.
 - 2. Parapet walls are to be the minimum required for code required fire separation walls.
 - 3. Combine all plumbing and mechanical vents below the roof in order to minimize roof penetrations.
- D. Building entries: It is desirable to include a vestibule at each major entry door.
 - 1. Each main entry will have a minimum of 2 sets of double doors (1 interior and 1 exterior) separated by a minimum of 7 LF.
 - 2. Doors will be either hollow metal or aluminum storefront with panic hardware and will be lockable.
 - 3. There will be a minimum depth of 6' of roof cover above each entry point.
- E. Interior wall sound control shall be provided at all rest rooms, conference rooms, directors offices and lecture halls.
- F. Entrances, hallways, and all high traffic common areas will be hard floor surface as specified. Offices and classrooms will be carpeted.
- G. Standard Classroom Requirements:
 - 1. Evacuation Map Holder: Acuform Evac Map Holder #DTA202
 - 2. Pencil Sharpener: Elmers Product #EPI1001
 - 3. Clock: Lacross #WT3161WH 16" Atomic Analog Brushed Metal with on/off daylight savings option

DIVISION 2 - SITE CONSTRUCTION

Section 02441 – Irrigation

PLASTIC PIPE AND FITTINGS

- A. All irrigation in drip type; no spray heads required.
- B. Plastic Pipe: All plastic pipe that will be under continuous pressure shall be Schedule 40 PVC and all non-pressure laterals shall be Class 200 PVC. All pipe and fittings shall conform to National Bureau of Standards.
- C. PS 22 and PS 21 for pressure pipe. PVC pipe shall be continuously marked with identification of the manufacturer, type, class, size, and shall conform to ASTM D 2241 meeting and classification system of ASTM D 1784. Solvent shall meet ASTM D 2274 and D 2855 requirements. Pipe shall be produced in 20 – foot lengths. Pipe shall be free of holes, foreign material, blisters, wrinkles or dents.
- D. PVC Flexible Nipple: All flexible nipples to use PVC flexible irrigation pipe, 1/2" IPS Heavy Wall Hose. 840 O. D. 147 wall thickness.
- E. PVC Fittings: Fittings on PVC lines under three inches shall be Schedule 40 PVC, Type 1, Cell Classification 13454-B, and shall comply with ASTM D 2466, D 2467, and D 1784.
- F. Risers and Threaded Nipples: All threaded PVC nipples shall be Schedule 80 PVC pipe as specified. Risers shall be Schedule 40 galvanized steel pipe unless otherwise specified.

VALVE BOXES

- A. All valves shall be installed in valve boxes with bolt-down lid as per manufacturer's recommendations.

AUTOMATIC VALVES

- A. Automatic valves shall have the minimum specifications of the type specified on the Drawings. Valves shall have a manual bleed screw in the handle and bleed ports protected with built-in filter. Valves shall be made of non-corrosive material. The valve shall be installable at any angle and have a flow control and manual shutoff. The solenoid shall be 24 volts A. C. 60 Hz and have a consumption not exceeding 2 watts. Standard Manufacture: Rainbird Valves.

CONTROLLER

- A. The controller shall have an infinite timing adjustment per station from 0 to 60 minutes and a 14-day programming capability. The controllers shall be capable of automatic, semiautomatic, or manual operation with multi-cycling capability. The controllers shall be UL listed and fused circuit protection shall be incorporated. There shall be no time lag between stations and a master valve circuit shall be standard equipment. Locks shall be provided on the timing mechanism and on the cabinet door. The controller shall be capable of manual operation with the timing mechanism removed.
- B. The controllers shall have no less than 4 stations. Some visual means must be provided to show which station is in operation at any one time. Controllers shall meet all safety standards required by OSHA.
- C. Controller shall be Rain Bird ESP Series, four-station, outdoor type, or approved equal.

WIRE

- A. Wire shall be UL approved for direct burial, type UF. Minimum gauge shall be No. 14 AWG. Wire shall be furnished in minimum 2,500-foot reels. Control wire must be insulated, single strand copper designed for 24 to 50 volts and copper conductor must meet or exceed ASTM B-3 specifications.

WIRE SPLICING MATERIALS

- A. All electrical wire splices must be made watertight using an approved sealing material such as PenTite PVC socket and sealing plug Rainbird PVC socket and sealing plug Rainbird PT-100 Series or an approved equivalent.

BACKFLOW PREVENTERS

- A. Backflow preventers: Wilkins Model 975XLV Reduced Pressure Principle with Elbows; sizes can vary
- B. Bubbler spray heads shall be Rainbird, spray heads shall be Rainbird, and control systems shall be Iritrol, all installed per Facilities Management standard. A serviceable screen shall be included on the bubbler to prevent foreign materials from entering sprinkler.

AUTOMATIC DRAIN VALVES

- A. Automatic drain valves shall be constructed of corrosion-resistant cyclolac plastic or brass. The valve shall open when pressure in line decreases to 3 psi and seal again when pressure increases to 3 psi. Valves shall have screens on both inlet and outlet and shall have ½ inch male pipe threaded connections. Automatic valves to be installed only on laterals of average pipe size 1-1/2" or less. Automatic valves to be installed at low points and at 100' on center in the laterals.

TRENCHING

- A. Excavations shall be of sufficient depth and width to permit proper handling and installation of the pipe and fittings. Cut trenches for pipe to the required grade lines. Compact the trench bottom to provide an accurate grade and uniform bearing for the full length of the line. Trenches shall be straight. When two pipes are in the same trench, maintain a minimum of four inches between the pipes.
- B. Depth: Trenches shall provide local – 30 inches clearance between top of pipe and finish grade for pressure lines, and 18 inches for non-pressure lines, except where indicated otherwise on Drawings. Lines between master valves and zone valves may be considered non- pressure lines. Shading materials shall be used at all utilities.
- C. Staking: Stake-out all sprinkler head and valve locations. Prior to trenching, the stake-out shall be approved by the Owners representative.
- D. Trim: Trenches shall be accurately trimmed to provide a uniform bed with a minimum 4" of shading, free from rocks, clods, or other sharp-edged objects.
- E. Dewatering: Any water which may be encountered or may accumulate in the excavation shall be pumped out or otherwise removed as necessary to keep bottom of the trench or excavation free and clear of water during the progress of the work.
- F. Sleeved Crossings: All pipe and wiring under sidewalks, roadways, or parking lots shall be sleeved in suitable PVC sleeves.
- G. Grade for Drainage: The minimum pitch to drains shall be 3 inches in each 100 feet

INSTALLATION

- A. General: Install all materials and equipment in a neat and workmanlike manner in accordance with the recommendations of the manufacturers of the materials and ASTM 2774.

B. Pipe:

1. Install plastic pipe in accordance with the manufacturer's recommendations and the approved procedures. Manufacturer's recommended procedures and the following requirement specified herein for making solvent welds shall be strictly adhered to. Plastic pipe and fittings shall be carefully handled and stored under cover to avoid damage. Beds upon which the plastic materials are to be transported or stored are to be the full length of the pipe to avoid causing damage. Damaged or dented pipe shall not be used in the work.
 2. Plastic pipe and fittings less than three-inch diameter shall be solvent-welded, using solvents and methods recommended by the manufacturer of the pipe, except that all connections between plastic pipe and metal valves or steel pipe shall be made with screw fittings, using plastic male adapters with a non-hardening pipe dope applied to male threads. Screwed connections shall be made up with light wrench pressure. Steel pipe shall not be screwed into plastic fittings except for head risers. Main lines under continuous pressure shall be welded with heavy-duty gray PVC cement.
 3. Application of solvent shall be with a non-synthetic bristle brush after thoroughly cleaning all pipe and fittings of dirt, dust and moisture. All solvent-welded joints shall cure at least 15 minutes before being moved or handled, and at least 24 hours before water is allowed to enter the pipe. Apply solvent in accordance with ASTM D 2855 using the procedure indicated below in the sequence shown.
 - a. Apply an even coat of solvent to the outside of the pipe, then to the inside of the fittings, and the reapply a light coat of solvent to outside of pipe, making sure that coated area of pipe is equal to the full depth of the fitting socket.
 - b. Inset pipe quickly into fitting and turn approximately one half turn to distribute solvent and remove air bubbles; check tees and ells for correct position.
 - c. Apply solvent at temperature above manufacturer's recommendation.
 - d. Use clean rags and wipe off excess solvent.
 - e. After solvent-welded joints have been allowed to cure for 24 hours, install sprinkler heads.
 - f. Pressure test piping as specified and have PM inspect prior to backfilling trench.
 4. Pipe shall not be laid in water or in trench when weather conditions are unsuitable for the work, except when otherwise expressly permitted. The interior of the pipe shall be thoroughly cleaned of foreign matter before being assembled.
 5. The full length of each section of pipe shall rest solidly upon the pipe bed, with recesses excavated to accommodate bells and joints. When work is not in progress, open ends of pipe and fittings shall be securely closed so that no trench water, earth or other substances will enter the pipes or fittings.
 6. Any section of pipe found to be defective before or after laying shall be replaced with sound pipe and retest.
 7. Minimum horizontal clearance between lines in the same trench shall be four inches.
- C. Saddle Taps: No saddle taps will be permitted. Branches shall be made only with fittings and reducers. Use no bushings, street ells, or close nipples, except at swing joint assemblies.
- D. Jacked Pipe: The crossing of existing pavement to remain shall be accomplished by jacking Schedule 40 steel pipe. The pipes shall be jacked to a tolerance of 1" in 10' off of true line and grade. The leading section of pipe shall be equipped with a jacking head securely attached to the pipe to prevent any alignment variation during the jacking operation.
- E. Controllers: The controllers are located on the Drawings. Make power connections at the location noted. Mount and wire the controllers according to the manufacturer's approved procedures and as specified as shown. Standard Manufacture: Rainbird.
- F. Sprinkler Heads: Sprinkler heads shall be of the type specified and shall be installed to grade unless otherwise specified. Install sprinkler heads a minimum of six inches and a maximum of eight inches from curbs, walks, driveways, building walls, etc. Teflon tape or Teflon sealer shall be used on threaded connection at heads and joints. Head shall be installed in the vertical position, hand-backfilled and compacted to near original density. Standard Manufacture: Rainbird
- G. Valves: Cover all automatic and manual control valves with locking valve boxes as specified. Set boxes to grade. Install all automatic valves in accordance with the recommendations of the manufacturer and as detailed.
- H. Control Wiring: Install control wires in same trenches as sprinkler main lines and laterals whenever practicable. The wires shall be snaked in the trench to allow for displacement of the wire during backfilling. Lay wires on the trench bottom on one side of the pipe only. All wire in same trench to be taped together every ten feet.
- I. Splices: Wire splices shall be kept to a minimum and if needed shall be made only in common splice boxes located in valve boxes. Provide a slack-wire loop at each valve with enough slack so that wire

splices can be extended 24 inches above ground level to facilitate testing and trouble-shooting. No wire size smaller than No. 14 AWG shall be permitted.

- J. Codes: All 115-Volt A. C. wiring shall be installed in accordance with the requirements of the National Electrical Code. Service to controllers shall consist of one black and one white wire. Electric control lines from controller to automatic valves shall be a different color from the 115-Volt service to the controllers. The 24-Volt common ground shall be of one continuous color and a different color from the other 24-Volt lines and the 115-Volt service. All electrically operated devices and all metal enclosures shall be connected to ground, as approved. All electrical power wiring above 24-Volt will be installed by a licensed electrician.

Section 02500 – Fencing / Outdoor Accessories

1. Specify 2" mesh formed from 9 gauge black vinyl wire unless otherwise noted 8' high fence ; End Post 2 7/8" Schedule 40; Top rail 1 5/8" schedule 20; Upright posts 2 3/8" schedule 20; with slats color TBD by owner.
2. Bike Rack: High Style FSC-LBR9PSURF, High Style Bike Racks, Finish: Black Powder Coat, Mount Style: Surface, height 36" Bike Capacity: 9 #of loops 7, 2 total. Existing or new concrete pad will be required at each bike rack location.
3. Wabash Valley: Ash, Trash, Benches & Picnic Tables. Black Diamond, Plastisol coated furniture

Section 02900 – Landscaping

General

- All new plants must be equipped with a drip irrigation system.
- Patch existing paths as required, to as is condition.
- All planting areas shall be mulched with gravel over woven or spun-bonded weed barrier. Plastic shall not be used. Fractured rock (3" – 6") is acceptable.
- All new plants shall be typical of their species and healthy, with full, symmetrical branching habits. Trees may be B&B or container-grown.
- Provide site design, plans, and all labor, materials and equipment necessary for finish grading, installation of planting mixture, trees, shrubs, ground cover, lawn and related work specified herein.
- Provide, as part of this contract and bid amount, for all trees, plants, and ground cover provided herein, 45 days of maintenance after acceptance of completed work. This maintenance shall include watering, weeding, cultivating, removal of dead material and debris, the resetting of trees, etc.

Sod: turf type fescue (tall fescue only) 1-1/2" thick w/no weeds - sod only on new construction.

Grass: over seeding acceptable only at existing grass areas.

Acceptable Plants:

Deodar Cedar	Arizona Cypress
New Mexico Locust	New Mexico Olive
Quaking Aspen	Staghorn Sumac
Three-Leaf Sumac	White Yucca
Gro-Low' Sumac	'Regal Mist' Muhly
Silky Thread Grass	Rocky Mountain Penstemon
Penstemon strictus	Turf-Type Tall Fescue
Mimosa	Arizona Ash
Salvia	Euonymus Alata
Cliff Rose	Potentilla
Caryopteris Blue Mist	Purple Robe Locust
Autumn Blaze Maple	Bradford Pear
Pinion Pine	Red Yucca
Dessert Spoon	Italian Cypress
Blue mist (native plant)	

Unacceptable Plants:

Privet	Sea Green Juniper
TAM Juniper	Pfitzer Juniper

Russian Olive
Cottonwood
Poplar
Leylandii Cypress

Prunus Purple Leaf Plum
Elm
Sycamore

Any deviation from plants listed above must be approved by PM.

Hardscape:

1. All borders between grass and landscape beds must have 6" concrete mow strip.
2. Walkways: poured in place concrete only, 6' wide by 4" deep reinforced. No paver walkways are permitted.
3. Retaining Walls: 6" to 12" stock fractured granite, boulders, cement block or concrete depending on requirements.
4. Ditches: 3" to 6" Salt River rock (or larger) w/weed mat underlayment (Polyspun/Landmaster)
5. Slopes: E-curlax 2 erosion control blanket w/acceptable ground cover plants
6. Ground Covering: Landscape rock ¾" sized Madison Gold rock and 1" screened Table Mesa rock for accent. Metal banding will be used between different types of gravel and rock.
7. Any 4:1 maximum slope for landscape, rock must have 4"-8" fractured rock. Up to 1:1 slope must have 12" fractured rock.
8. Decomposed granite is prohibited, U. N. O.
9. Seal concrete per Hanson Aggregate Specifications.

DIVISION 3 – CONCRETE

1. All Exterior concrete walkways shall have 4" compacted ABC base. Flatwork shall have a minimum 4,000 psi. 4" min. on thickness of concrete with thickened edges, 6" min. unless approved by PM to omit. Broom finish.
2. All concrete used in ERAU projects shall be supplied by Hanson Aggregates of Arizona special formula "#160X109 Winter" or "#160X149 Summer" depending on time of year. Install concrete per Hanson Aggregate proprietary specific instructions.
3. Curing compound provided on all slabs per Hanson Aggregate specifications.
4. Footings shall be a minimum of 4,000 psi concrete. Per approved construction drawings.
5. Pin into all existing sidewalks and saw cut or install control joints in curbs along every sidewalk joint.
6. Seal all exterior isolation and control joints that penetrate concrete with a polyurethane compound designed for the purpose and applied by a licensed and certified sealant contractor.
7. Seal concrete within 28 days of curing in the morning, with the concrete temperature between 50-80 degrees. Prior to sealing pressure wash concrete and allow to thoroughly dry before applying sealer. Sealing product as recommended by Hanson Aggregate to be manufactured by DIS; for application follow sealing manufacturer's instructions.

DIVISION 4 – MASONRY

1. Exterior walls with mixture of split face and plain integral color CMU are preferred.
2. All exterior masonry will be sealed.
3. Typical wall assemblies are colored conc. / masonry / metal / glass.
4. Exterior masonry walls shall be furred out with 3 5/8" metal studs w/ R11 batt insulation on interior. 6" furr out at plumbing walls. Where exposed masonry use R12 foam filled CMU cells.
5. No wood, no stucco on exterior finishes; EIFS is acceptable

DIVISION 5 – METALS

1. Exterior railings and handrails will be steel. Minimum schedule 40 pipe or ASTM A 500 structural tube, prime with Sherwin Williams B50AZ6 Kem-Kromik Grey and finish with Sherwin Williams F75BC14 Sher-Kem Raven Black.

DIVISION 6 - WOOD & PLASTICS

Section 06100 - Rough Carpentry

1. Minimum thickness of roof sheathing, 5/8" cdx plywood. U. N. O.

Section 06200 - Finish Carpentry

1. Formaldehyde containing particleboard and similar composition products are not allowable.

Section 06240 - Plastic Laminates

1. Guides for plastic laminate finishing are as follows: min. .050" exposed horizontal surfaces; min. .028" exposed vertical surfaces; min. .020" cabinet linings and concealed backing.

Section 06420 - Custom Casework

1. Case or millwork specified as receiving a painted finish should be limited to lower cost species (birch, poplar, etc...).
2. All cabinet and millwork tops, sides, dividers, shelving, etc. , shall be 3/4" minimum stock.
3. Stained veneer materials shall conform to AWI custom grade, minimum thickness 1/16".
4. Unexposed framing shall be nominal 1 x 2 hardwood, AWI custom grade.
5. Doors and drawer fronts shall be 3/4" minimum core stock.
6. Drawer boxes shall be 1/2" minimum with minimum 1/4" plywood bottoms.
7. Cabinet tops should be of sufficient height to comply with minimum disabled accessibility requirements, all cabinets to come with locks.
8. Most shelving should be designed as fully adjustable, 3/4" minimum thickness.
9. "Line bore and pin" method of shelving adjustment (either in cabinets or standing shelving) is desired. Shelf standards mortised in with brackets is also acceptable.
10. All millwork and accessory hardware shall comply with ANSI A156. 9, minimum quality level Type 2 (institutional). Hinges, guides, slides, etc. , shall utilize bearings complying with BHMA 201.
11. All cabinet hinges should be self-closing.
12. Drawer slides should allow full extension (1" longer than total drawer depth) and be specified as heavy duty (100 lb. minimum), Blum or approved alternate.
13. The use of painted particleboard as the finish for cabinets and tops is not acceptable.
14. Particleboard is allowable as core stock in low/no moisture areas when receiving a high-pressure plastic laminate finish.
15. Particleboard is not an acceptable material for shelving with greater than a 2 foot unsupported span.
16. The use of melamine or other similar low mill finishes (less than .020") as interior cabinet lining or underside of shelving is not acceptable. Melamine thermo fused 3/4" is acceptable for interior finish of cabinets only.
17. All exposed cabinet hardware should be specified with a permanent, durable finish that is easily cleanable. Cabinet pulls 4" brushed aluminum wire.
18. All countertops designed as work surfaces shall be of an appropriate height to accommodate the physically disabled.
19. Restroom counter tops for lavatories will be composite material open on bottom with self-rimming sinks. Sheet mirror mounted full length of wall above top. Top manufacturer to cut lavatory openings in top to dimensions supplied by the plumber. Color TBD by owner.
20. All millwork designed to support electrical equipment (computers, phones, clocks, etc...) shall have grommet openings allowing cords, interconnect cables, etc. , to be concealed or routed internally. Grommets shall be 2-1/2" minimum diameter plastic, color to match adjacent finish. Grommet holes are to be drilled on-site by cabinet installer after equipment layout is determined by IT staff who will mark appropriate locations.
21. Standard Cabinet Finishes unless specified otherwise on plans:
 - a. Counter Top LES6002 Charcoal Essence
 - b. Cabinet Faces LWM8258 Beige Renaissance
 - c. Edge Banding Doellken #2367 Pebble
 - d. Counter Top Wilsonart Slate Gray
 - e. Cabinet Faces Wilsonart Flame Soapstone 4884-38
 - f. Edge Banding Slate Gray

DIVISION 7 - THERMAL & MOISTURE PROTECTION

- Roofing sub-contractors must have a minimum of 10 years' experience in Prescott and able to guarantee the roofing for a minimum of 20 years.

Section 07100 - Waterproofing

This section applies to sheet waterproofing of building components that receive, or are in and around areas to receive such treatment. Proper architectural design and detailing of areas exposed to moisture should not rely solely on such treatments as the only barrier to moisture, but rather as a "guarantee" or "second line of defense"; in other words, the design and specification of appropriate materials should in itself greatly mitigate a majority of moisture infiltration problems.

1. Metal coping to have Kynar factory finish

Section 07200 - Insulation

1. Design Standard: Roofing systems in conjunction with proposed insulation or other exposed horizontal surfaces shall attain a minimum composite R-value of 30.
2. Roof insulation should be installed just below the roof sheathing so the fire sprinkler system is in a warm space.
3. Walls or other exposed vertical surfaces shall attain a minimum composite R-value of 19.

Section 07212 - Board Insulation

1. Exterior board insulation to be Dow "Styrofoam" or U. L. Industries "Foamular" or Amoco "Amofoam" extruded polystyrene foam. Bead board is not acceptable.
2. Exterior board insulation must be installed over an approved vapor barrier.

Section 07412 - Metal Roofing & Siding

1. Metal roofing to be standing seam, concealed fasteners, 24 ga. , UL 90 wind uplift design
2. Maximum fastener row spacing 24". Galvalume ASTM A 792 coating, 20 year warranty. Install over minimum No. 30 roofing felt. 24 ga. Zincalume coated steel w/ 20 year warranty. Copper penny 6 Kynar.

Section 07460 - Rain Gutters & Leaders

1. Gutters & leaders to be continuous. 026 gauge aluminum with factory finish; gutters to be installed with brackets spaced at 3'-0" min.
2. Leaders to continue to underground pipes to lead water a minimum of 10 ft. away from the building on the downhill sides.
3. On the uphill sides of buildings, pipe the rainwater around the building and daylight drains a minimum of 10 ft. away from the buildings.
4. Do not discharge rainwater towards a neighboring building.
5. Gutters to be a min. 5" depending on Sq. Ft. roof area to be drained. Downspouts to be a min. 3" X 3" depending on Sq. Ft. of roof to be drained.

Section 07500 - Membrane Roofing

1. This section applies specifically to membrane roofs, but also pertains to other methods of roofing or those areas effectively acting as "roofs" (decks, overhangs, balconies, etc...).
2. To aid in attaining both the written specification and warranties called for by ERAU, the A/E should design and detail appropriate roof slopes, drainage system(s), cants, flashing, protection devices or materials and utilize good common sense.
3. Roofing techniques, systems and materials should be utilized that are "time proven" (+5 years) and be designed as "composite" systems instead of appliques.
4. Roofing contractor must be approved by the manufacturer whose materials are used. Materials to be used are Tremco roofing systems.

DIVISION 8 - DOORS & WINDOWS

Section 08110 - Steel Doors & Frames

1. Doors, frames and hardware shall be specified as commercial heavy-duty quality. Pre-finished anodized bronze. Minimum door thickness shall be 1-3/4" thick. Interior doors shall comply with SD1-

- 100, Grade II, and heavy-duty, minimum 16-gauge faces. Exterior doors shall comply with SD1-100, Grade III, and extra heavy-duty, minimum 16-gauge faces.
2. All exterior doors shall have Pemko 272A thresholds, weather-stripping and padded floor stops and LCN 4040HW closures.
 3. Door Frames: All frames shall be specified as welded. Knockdowns are not acceptable for exterior doors, but are acceptable for interior doors. An inspection of anchoring method must be made prior to drywall or closing up of walls.
 4. Doors: All exterior doors that are not storefront will be 16-gauge steel doors and 14-gauge steel frames with vertical steel rib stiffeners and reinforced for all door hardware.
 5. Hinge: Roton continuous door hinges are required at all exterior storefront doors.

Section 08200 - Wood and Plastic Doors & Frames

1. This section applies to interior applications. Do not specify endangered or limited tree species for wood door veneers. Doors receiving painted finishes should be limited to low cost species (birch, maple, etc.). Welded hollow metal frames should be utilized. (Timely frames are acceptable for remodel applications.)
2. Wooden doors are acceptable only for interior usage, must be solid core, and have adhesives that are 100% waterproof. Hollow core doors shall not be used.
3. The minimum grade door used will be solid core flush prime coat hardboard, commercial heavy-duty grade, 1-3/4" thick. All doors should be specified from a single manufacturer.
4. Use site lights adjacent to all conference room and office doors and in areas determined best by designing architect.
5. Doors shall have a minimum of 3, 26d ball bearing Ives 5BB1 hinges.
6. Masonite painted solid core interior doors are an approved alternate.
7. All interior doors may have knockdown frames.

Section 08410 - Aluminum Entrances and Storefronts

1. All exterior glass shall be insulating glass, except vestibule doors and windows.
2. Glass manufacturer shall provide a written warranty that shall guarantee insulating glass units for a period of 10 years.
3. Aluminum entrance section hardware shall meet all requirements in Section 08700.
4. Pemko weather-stripping for exterior doors shall be continuous at head, jambs and door bottoms.

Section 08420 - Steel Entrances and Storefronts

1. Steel entrances and storefronts shall pass water leak testing prior to substantial completion and prior to payment for materials and labor. Test area shall include perimeter caulk joint. All retesting and associated costs shall be paid for by the Contractor, via deduct change order.
2. Glass manufacturer shall provide a written warranty that shall guarantee insulating glass for a period of 10 years.
3. Steel entrance section hardware shall meet all requirements in Section 08700. Pemko weather-stripping for exterior doors shall be continuous at head, jambs and door bottoms.

Section 08500 - Metal Windows

1. Glass manufacturer shall provide a written warranty that shall guarantee insulating glass units for a period of 10 years. Windows will be Better-Bilt or equal.
2. All windows shall pass water leak testing prior to substantial completion and prior to payment for materials and labor. Test area shall include perimeter caulk joint. All failed windows shall be retested until they pass. All retesting/associated costs shall be paid by Contractor, via deduct change order.
3. Interior windows to be fixed, hollow metal frame with thermal break

Section 08710 - Hardware

A. Closures:

Exterior entry doors shall have commercial, heavy-duty LCN closers with hold open feature.

1. Concealed overhead - LCN 2031
2. LCN 4040 HW (hold open)

B. Locks:

1. Furnished and installed by contractor. Locksets will be Yale Grade 1 with Best small format core. Lever handle, heavy duty locksets, 2 3/4" backset, satin chrome finish Keys will be Yale Grade 1.
 - a. Model #B-AU5405LN 626 YALE Satin Chrome Lever handle (storage room)
 - b. Model #B-AU5404LN 626 YALE Satin Chrome Lever handle (when needed on exterior doors)
 - c. Model #AU5401LN 626 YALE Satin Chrome Lever handle (passage set, for non lockable doors).
 - d. Model #ECL-230D, DETEX emergency exit device for fire exits.
 - e. Model #99 (series), VON DUPRIN Rim Device & Exit Panic Bars,
2. Electronic card lock system required for high volume public access exterior doors will be Blackboard Security Access SA3000
3. Electronic card lock system Onity Stand-alone #KTD-C-12-626 will be required for the following doors: Laboratory, Janitor, Mechanical and Equipment, IT and Special System, Electrical rooms and designated Non-Classroom doors.
4. Onity Panic Conversion #KTA-RIMVD-626 will be required on all high occupancy classroom doors.
5. Onity KTD-M-F626 will be required on all classroom doors no exceptions.

C. Keying Systems:

1. ERAU to arrange meeting to determine keying needs. To attend: Department Head, Project Manager, Director of Safety, and Locksmith.
2. Use standard ERAU keying codes. Provide Best small format keying system.
3. Use only original key blanks for all areas other than student dorm rooms.
4. Use neuter bow key blanks for all student dorm areas. They must be stamped "DO NOT DUPLICATE."
5. See University Locksmith for Master key codes, keyway types, and keying levels before starting work.
6. Key mechanical rooms, maintenance areas, custodial areas, and IT areas differently. See Locksmith for codes.
7. Supply legible records to University Locksmith, with floor plans, building codes, flow charts, and door numbers.
8. Supply 6 each construction keys to Locksmith.
9. Consult Director of Safety and Project Manager when in doubt, or if any questions should arise during any phase of construction.
10. Provide removable cores, to be installed by Contractor at end of job; end user cores provided by the contractor, keyed and installed at the completion of the job. Lock core, 6 pin, Best small format, keyed to University standards.
11. Copy Project Manager on any transmittals to Safety Department or University Locksmith.
12. Construction cores are to be provided and installed by Contractor.
 - A. All exterior locks and cylinders shall be Best system, interior locks and cylinders shall be est.
 - B. All locks and cylinders to be construction master keyed in a manner that can be removed.
 - C. Provide 3 each change keys per lock and 6 each grand master and master keys. Stamp "DO NOT DUPLICATE."
 - D. All cores are to be Best, small format.

D. Hardware:

1. All doors that can hit walls shall have Ives floor stops with rubber bumper.
2. All interior hollow metal frames shall have rubber door silencers equal to Ives 20 silencers. 2 per pair and 3 per single doorframe.
3. Panic hardware is to be provided where required by Codes and on any exterior doors that have security card access.
4. All doors shall have a minimum of 3, 26d ball bearing hinges Ives 5BB1. Roton continuous door hinges are required at al exterior storefront doors.
5. All door hardware, including but not limited to: strikes, hinges, closers, panic hardware, stops, thresholds, sweeps, pulls on exterior doors will be furnished and installed by Contractor.
6. Exterior hinges to be stainless steel (32D); interior hinges to be brushed chrome. Door closers finish to be brushed chrome. Lockset finish to be brushed chrome, Exit devices to be anodized

aluminum. Overhead holders to be brushed chrome. Flat goods to be stainless steel or brushed chrome and the thresholds to be mill finish aluminum.

E. Acceptable Manufactures:

Acceptable Manufacturers - to the greatest extent possible, obtain each kind of hardware from one manufacturer only.

<u>Product Specified</u>	<u>Manufacturer</u>
- Hinges	Ives #5BB1
- Locksets, latch sets, privacy sets, cylinder keys and keying	Yale w/Best small Format Core unless specified otherwise on plans
- Lock Cores	Best small Format Core unless specified otherwise on plans
- Door closers	LCN 4040 HW
<u>Product Specified</u>	<u>Manufacturer</u>
- Overhead concealed closers	LCN 2031
- Protection plates, pull plates, wall bumpers, floor stops, door stops, flush bolts	Pemko Mfg. Pemko Mfg. Ives #FS438 US26D Ives #WS406CCV 630 Ives #WS401CCV
- 1-1/4" diameter door pulls	Ives
- Overhead stops & holders	Yale
- Thresholds, drip caps weatherstrip	Pemko Mfg. #272A (size of door) Pemko Mfg. #315CN (size of door)
- Key cabinet	Lund Equipment
- Exit devices	Von Duprin

Consult PM for any alternates to above specifications.

F. Finish Hardware

PART I – GENERAL

1. 01 - Work Included

- A. This section includes furnishing of all items of finish hardware as hereinafter specified or obviously necessary to complete the building, except those items that are specifically excluded from this section of the specification.

1. 02 - Related Work Specified Elsewhere

- A. Hollow metal doors and frames
- B. Heavy duty Aluminum anodized doors and frames
- C. Wood doors and frames

1. 03 - Description of Work

- A. Furnish labor and material to complete hardware work indicated, as specified herein, or as required by actual conditions at building.
- B. Include all necessary screws, bolts, expansion shields, and other devices, if necessary, as required for proper hardware application. The hardware supplier shall assume all responsibility for correct quantities.
- C. All hardware shall meet the requirements of federal, state and local codes having jurisdiction over this project, notwithstanding any real or apparent conflict herewith in these specifications.
- D. Fire-Rated Openings
 - 1. Provide hardware for fire-rated openings in compliance with A. I. A. (NBFU) Pamphlet No. 80, NFPA Standards NO. 101, UBC 702 (1997) and UL 10C. This requirement takes

precedence over other requirements for such hardware. Provide only hardware that has been tested and listed by UL for the types and sizes of doors required, and complies with the requirements of the door and doorframe labels.

2. Where panic exit devices are required on fire-rated doors, provide supplementary marking on door UL label indication fire door to be equipped with fire exit hardware and provide UL label on exit device indication "Fire Exit Hardware"
- E. Fasteners
 1. Hardware as furnished shall conform to published templates generally prepared for machine screw installation.
 2. Furnish each item complete with all screws required for installation (typically, all exposed screws installation).
 3. Insofar as practical, furnish with square head screws, finished to match adjacent hardware.
 4. Install door closers and exit devices with close head through bolts (sex bolts).

1. 04 - Quality Assurance

- A. The supplier must be a directly franchised distributor of the products and have in their employ an AHC (Architectural Hardware Consultant). This person is to be available for consultation to the architect, owner and general contractor at reasonable times during the course of work.
- B. The finish hardware supplier shall prepare and submit to the architect or Project Manager 6 copies of a complete schedule identifying each door and each set number, following the numbering system and not creating any separate system. The finish hardware supplier shall submit the schedule for review, make corrections as directed and resubmit the corrected schedule for final approval. Approval of schedule will not relieve contractor of the responsibility for furnishing all necessary hardware, including the responsibility for furnishing correct quantities.
- C. No manufacturing orders shall be placed until detailed schedule has been submitted to the architect and written approval received.
- D. After hardware schedule has been approved, furnish templates required by manufacturing contractors for making proper provisions in their work for accurate fitting, finishing hardware setting. Furnish templates in ample time to facilitate progress of work.
- E. Hardware manufacturers are to supply both a pre-installation class as well as a post-installation walk-thru to ensure proper installation and provide for any adjustments or replacements of hardware as required.

1. 05 - Delivery, Storage and Handling

- A. Wrap to protect finishing hardware items for shipment. Deliver to manufacturing contractors' hardware items required for their application; deliver balance of hardware to job; and store in designated location. Each item shall be clearly marked with its intended location.

2. 03 - Hinges and Pivots

- A. Exterior butts shall be stainless steel. Butts on all out swinging doors shall be furnished with non-removable pins (NRP).
- B. Interior butts shall be as listed.
- C. Doors 5' or less in height shall have 2 butts. Furnish 1 additional butt for each 2'6" in height or fraction thereof. Dutch door shall have 2 butts per leaf.

DIVISION 9 - FINISHES

All finishes are per below unless specified otherwise on plans and approved prior to construction by the Architect.

Section 09251 – Gypsum Wallboard

1. ASTM C 36; regular types except where special types are required. Minimum 5/8" thick.
Texture: Light Skip Trowel,

Section 09580 – Suspended Decorative Grids

1. Ceiling tile – 2'x 2' Armstrong #770 White non directional 5/8".
2. Suspended 15/16" metal white grid.

Section 09630 – Masonry Flooring

1. Glazed tile is the only acceptable tile finish.
2. Ceramic tile in restrooms shall be Refin Ceremiche Glazed Porcelain Tile Color: Fabula Beige 12" X 12" on walls with three rows of Emperador Dark 1"X1" Polished Mesh Stone and one Linea Listelle Meici Walnut 1" top border to 4' AFF. Floor tile shall be 20" x 20" Ragno Glazed Porcelain Tile Color; Noce.
3. Ceramic tile traffic areas and offices shall be 20" x 20" Ragno Glazed Porcelain Tile Color; Noce.
4. In all applications except residence halls, Shower pans: Ragno Glazed Porcelain Tile Color; Noce with curb on floor and Refin Ceremiche Glazed Porcelain Tile Color: Fabula Beige 12"X12" surround on wall from the floor to the ceiling full height. Floor to be floated before tile is installed.
5. Grout shall be Poly-Blend #59 Saddle Brown
6. Seal grout, stone, unglazed tile, and expansion joints with an appropriate sealer 48-72 hours after grout application and per manufacturer's recommendations.
7. No finish of any kind is to be applied to glazed ceramic tile

Section 09650 - Resilient Flooring and Accessories

1. Vinyl composition tile shall be applied with a suitable waterproof mastic.
All VCT tile floors are to be sealed by the contractor, minimum 2 layers, per manufactures recommendations.
Standard VCT: Armstrong Excelon 51804 Earthstone Greige (primary). 51803 Pearl White (accent).
2. Tile shall be a minimum of 12" x 12" x 1/8" Composition 1, asbestos free, rated as heavy-duty commercial. A minimum of 2% or one box of product as extra for maintenance purposes is required. Product extra requirements apply to each type/color or product if more than one is specified.
3. When a composition base material is utilized, it is to be a rubber base rather than vinyl. Specify that all inside & outside corners shall be pre-formed. Base shall be 4" toeless base, Black in color with matte finish. Exposed or junction edges of the tile shall receive vinyl or aluminum reducer strips.
4. Exposed integrally colored concrete may be used in high traffic areas.

Section 09685 - Carpet

1. Classrooms and offices: C&A Crayon Power-bond Cushion RS Precious Metal #48010, walk-off carpet at doorways: C&A Abrasive Action Power-bond Cushion Charcoal #19100
2. Residence Hall:
 - a. Rooms: C&A Aftermath II Powerbond Cushion RS Lapis/Marine #23517
 - b. Halls: C&A Color Spectrum Powerbond Cushion RS Vibes #48003
 - c. Walk-off carpet: C&A Abrasive Action Power-bond Cushion Midnight Blue #19101
3. Carpet to be rolled cut
4. Carpet to be installed by certified Tandus installers.
5. Cove base 4" black vinyl as manufactured by Roppe or Armstrong

Section 09900 - Painting

1. Painting products shall be specified from Sherwin Williams.
2. Kitchen, break rooms, restroom, labs, doors, door trim and window trim shall be Semi-gloss.
3. Classrooms, offices, hallways, reception and assembly areas shall be Eggshell.
4. All wet areas to have semi-gloss mildew resistant paint.
5. University Standard Paint Colors:
 - a. Offices Interior Classrooms and Residence Halls : SW6099 Sand Dollar wall color
 - b. Interior Trim Offices: SW6093 Familiar Beige (doors, frames, wood trim)
 - c. Overhangs and Ceilings: SW6098 Pacer White
 - d. Exterior Body: SW6101 Sands of Time
 - e. Exterior Trim: SW6102 Portabello (if matching existing Canyon Brown use SW....)
 - f. Exterior Door: SW6230 Rainstorm (Interior side of door matches the interior trim)
 - g. Hollow Metal Doors and Windows Visitor Center SW7017 Dorian Gray
 - g. All exterior steel: Including light poles, handrails to be painted Sherwin Williams B50AZ6 Kem-Kromik Grey primer and finish with Sherwin Williams F75BC14 Sher-Kem Raven Black
6. Private Residence / Observatory Buildings R1, R2, R2-A, R3, R4, R5
Exterior Body: Sherwin Williams Paint Color 6088 Nuthatch

Exterior Trim & Garage Door: Sherwin Williams Paint Color 6089 Grounded
Exterior Doors: Classic Paint Color 474 Mistletoe

7. Accent Paint Colors:

- a. Green: SW6166 Eclipse
- b. Red: SW0006 Red Toile
- c. Yellow: SW6388 Golden Fleece
- d. Yellow: SW6128 Blonde
- e. Blue SW6517 Regatta

Section 09950 – Wall Covering

1. Ceramic tile minimum 6" X 6" on all wet walls and other restroom walls to top of partition, throughout.
2. At all janitor's closets install FRP wainscot on all wet walls.

DIVISION 10 - SPECIALTIES

Section 10150 - Toilet Compartments

1. Partitions to be floor mounted with overhead support
2. Phenolic or steel, or plastic partitions to be specified
3. Partitions mounting bracket to be continuous

Section 10100 - Visual Display Boards

1. To be provided and installed in Classrooms and Labs by contractor as part of construction budget; whiteboards to be 4' high x 8' long.
2. All white boards to be porcelain enamel marker boards. Porcelain enamel warranty: Furnish the manufacturer's written warranty agreeing to replace porcelain enamel whiteboards that do not retain their original writing and erasing qualities.
3. Acceptable Manufacturers: Quartet TE548A Prestige
4. Acoustic sound panels Allied Acoustical, Inc. 1730 W. Buchanan, Phoenix

Section 10260 – Wall and Corner Guards

1. Chair rails are desirable in all classrooms. Prefer high impact PVC 1/8" thick.
2. Corner guards shall be provided in all high traffic areas. Mfr. & Style must be approved by PM.
3. Consider chair rails and corner guards in all traffic areas.

Section 10400 - Identifying Devices

1. All interior signs shall conform to ERAU signage specifications and ADA.
2. Occupied Rooms: Apco IM series 8"X8" Pearl Grey #A78, Holder SH-88, Insert SI-SL-88 (clear lense) #A78 Pearl Grey, ADA Band Laminate size 23/8"X8", Photopolymer color #A78 Pearl Grey, ADA Graphic copy: HelveticaNeue-Bold (HM) size: 1" color: AO2 Black (braille color: same as background).
3. Non-Occupied: Apco Acrylic Plaque series #341A size 2"X4" #a78 Pearl Grey silk screen graphic, HelveticaNeue-Bold (HM) size: 1" AO2 Black.
4. Signage may be fabricated by Owner; cost is to be part of construction contract.
5. Signage to be installed by Contractor; locations to be determined by PM.

Section 10520 - Fire Protection Specialties

1. Fire extinguisher cabinets to be recessed and ADA approved. Cabinet doors shall be clear glass. Top of cabinet door not to exceed 54" A. F. F. Bottom of cabinet 30" to 32" AFF
2. Campus standard for Fire Hydrants is Waterous. Model #: to be determinate by civil engineer.

Section 10800 – Toilet & Washroom Accessories

1. Wall mounted silver receptacle - female stalls: Tough Guy #1ECK9
2. Sanitary Napkin: Receptacle Rubbermaid 6140
3. Hand Soap Dispenser GOJO FMX-12 Black
4. Seat cover dispenser: Georgia Pacific #57748
5. Jumbo Bath Tissue Dispenser 9 in C: Georgia Pacific #59209

6. Receptacle Liner Black: Rubber Maid 3569-88 Black
7. Roll Towel Dispenser: Tork Elevation Matic 5510282
8. Bathroom Changing Station: Koala Bear Kare Oval Baby Bear Changing Station Model#KB108-12 Grey Granite
9. Sheet mirror mounted full length of wall above vanity top.

DIVISION 11 – EQUIPMENT

Section 11130 – Audio Visual Equipment

1. All ceiling mounted projectors to have 120V electric outlet at ceiling with 2-gang low voltage mud-ring and 2" conduit into ceiling space at wall near instructor's station. Fixed overhead and computer projectors and monitors to be provided by Owner (FF&E budget.)
2. Projection screens provided and installed by Contractor; provide adequate blocking.
 - Hang in center of room approx. 134" +/- from 96" screen
 - Blocking for projector to be provided
 - 2 speakers (Owner provided) on either side of projector for sound amplification
 - Media Services Contractor to install all Owner provided equipment

DIVISION 12 – FURNISHINGS

Section 12500 – Window Coverings (Curved PVC)

PVC - Virgin vinyl with anti-static coating. thickness min. .050", beaded edge .003". Non-perforated; (see standard below) Color selection to be approved by PM.

Track - G71 Style metal scissors or equal (No plastic scissors).

Track Format - 1-15/16" width, 1-3/8" height wall average 0.050" and material of clear anodized aluminum alloy 6063-T5. Carriers - G71 style

Cordless wand control. Stack to one side.

Blind Manufacturer: Springs Window Fashions, Model: "Signature Series" provided by Budget Blinds of Prescott.

Section 12670 - Rugs & Mats

1. Contractor to provide aluminum grate entrance mats on interior and exterior of major entries.
2. Contractor to provide interior walk-off carpet as required.

DIVISION 13 - SPECIAL CONSTRUCTION

Section 13825 - Security Systems

Section 13835 - Elevator Monitoring Control Systems

Section 13845 - Alarm Detection Systems

Section 13850 – Door Control Systems

1. Honeywell One Card Security System access to Entry Doors
2. On all suite main entry doors, install Onity Stand-a-lone #KTD-C-12-626, Panic Conversion #KTA-RIMVD-626.
3. All exterior doors to be monitored with:
 - a. Monitor/reader
 - b. Honeywell security monitors
4. One set of entry doors to be equipped with automatic opener to meet wheelchair accessibility codes.

Section 13900 – Fire Suppression and Supervisory Systems

1. All construction to conform to City of Prescott fire alarm and fire sprinkling requirements.
2. Fire alarm: Notifier Onyx Works compatible is the only acceptable manufacturer.
2. Manual fire Alarm Pull Stations Notifier Onyx Series shall be used.

3. Horn/Strobes Notifier Onyx Series shall be used
4. Each building will have a separate Notifier Onyx Works compatible alarm panel with fire and security alarm detectors all connected to the University wide monitored alarm system.
5. Alarm panel must be programmable by selected ERAU vendor. Single source vendors not acceptable unless approved by ERAU.
6. Contractor to provide portable fire extinguishers and shall mount, locate and install per Fire Marshall recommendations. All fire extinguishers shall have appropriate signage. OSHA 1910.157(c)(1) provided by the contractor.

DIVISION 14: CONVEYING SYSTEMS

Section 14200 - Elevators

1. No proprietary elevator systems are to be specified.
2. Elevators can be Dover, Marquis, Thyssen Krupp or other approved; elevator to be hydraulic.
3. Elevator controls shall comply with the most recent Fire / Life Safety and ADA codes.
4. Specifications shall include attention to interlock to existing or proposed fire detection systems and devices.
5. Machinery spaces shall be located to minimize vibration and noise, and shall be fully sound attenuated if located near occupied areas.

DIVISION 15: MECHANICAL

Section 15010 - General

1. Each building will have separate gas and water meters provided and installed by Contractor.
2. If exterior equipment is ground mounted shall be on concrete pads. (Roof mounted units are acceptable if roof has access)
3. All mechanical rooms and spaces shall be adequately sized, lighted and arranged so that any and all repair and maintenance that may be necessary can be performed. Controls, mixing boxes, balance dampers, fire dampers, valves, filter banks, heat exchanger coils, pumps, belts, etc., shall be accessible for repair or replacement and shall not be obstructed by any pipe, conduit or other obstacle. Contractor is responsible to coordinate all trades to insure access is available to all new units.
4. All gas appliances shall be de-rated for the appropriate elevation.
5. All service and supply systems, including, but not limited to, steam, high temperature hot water, natural gas, domestic water, waste and electrical, shall be sized for peak demand throughout the project and shall be sized as far back as the main meter or central distribution system. The adequacy of any central distribution system to carry all added peak loads shall be determined, and no loads shall be connected to any such system that is determined to be undersized.
6. Drainage piping in labs where chemicals are used is to be caustic or acid resistant.
7. No plastic or PVC water piping will be used for potable water supply. Use soft copper type L on all yard lines up to 2".
8. Sewer pipe to be Schedule 40 DWV, not SDR 35. Note: In some cases ABS piping is acceptable for below grade waste piping, must have written authorization from PM
9. Provide shutoff valves, readily accessible in wall or ceiling for EACH room with water service. All shutoff valves should be high quality, domestic "ball valves". Facilities Maintenance Department to approve all valve locations prior to finalizing plans/specs. All concealed or vandal-proof vanities are to provide ready access to maintenance personnel. All access panels to be hinged and lockable.
10. All concealed valves, trap primers, air chambers, mechanical devices shall have stainless steel, hinged, lockable access panels measuring no less than 12" x 12".
11. Floor grade to all shower and floor drains must be sufficient to drain the entire area served.
12. The Professional Consultant, through his sub-consultants, shall be responsible for coordination of all systems including, but not limited to, electrical systems, control systems, heating and cooling systems, plumbing systems and any other mechanical systems as one included in the building design. This responsibility includes all mechanical sub-contractors, Federal, State and Local agencies, and franchised service companies.

13. The Professional Consultant shall construct a process and instrumentation diagram drawing depicting all pressure gauges, thermometers and flow meters required for the project. Included on this drawing shall be actual design flows, pressures and temperatures for each and every system.
14. Gauges and thermometers shall be specified for all HVAC equipment.
15. Quality Assurance: The selection of products or service companies shall be from those firms whose products or services have proven satisfactory in similar service for not less than three years.
16. Repair or replacement parts, or required service, shall be readily available, and the supplier of products or services shall have a proven track record of response to complaints or problems during, and after, the warranty period.
17. Use Danfoss VFD's on all HVAC equipment specified for variable frequency drives, or equal. Unless proposed alternate is approved by owner.
18. All exterior underground gas piping must be installed per code and the Arizona Corp. Commission requirements. Piping is to be PE pipe manufactured by Rinker.
19. Heating for all facilities is to be provided using gas-fired equipment: NO ELECTRIC HEAT WILL BE ACCEPTED
20. Where chillers are used, they are to be air-cooled type: NO COOLING TOWERS WILL BE ACCEPTED. Provide freeze protection for all exposed piping and components (Specify type: glycol, heat tape...)
21. In most cases the roof rainwater drainage is to be connected to the campus storm water drainage system. Overflow drainage is to be addressed using roof scuppers or overflow drains separately piped to grade.
22. All buildings are to have a backwater valve on 3", 4" and 6" drains. Valves to be CLEAN CHECK INC. U.N.O. Extendable backwater valve.
23. All underground meters, valves, etc. shall be in boxes appropriately designed for the utility and clearly marked with the utility name. (i.e.: Gas, water, electric, etc.)
24. Hot and cold fluid piping is to be insulated to avoid heat loss and condensation.
25. All ductwork is to be insulated on the outside of the duct lines to avoid condensation. Avoid the use of internal duct insulation and duct board as the duct lining will deteriorate and insulation particles are blown into the building spaces. It is acceptable to use internal duct insulating liner (w/ backing that can be cleaned) for the first 20 feet of ductwork before and after air handler fans and in the low velocity ductwork downstream of the VAV boxes to minimize system noise to the space.
26. Ambient noise should not exceed 50% of the OSHA PEL for the given type of work space.
27. Design should consider equipment efficiency. Factor in equipment lifecycles costs, energy cost and installation costs before a system is selected.
28. At completion of the project an air balance shall be performed on all forced air systems by an independent certified air balance company.
29. Detailed drawings of all mechanical equipment layouts are required to insure there is adequate room for maintenance. All designs must provide adequate access for maintenance of all mechanical equipment or replacement of filters. Consider location, avoid loud equipment in work areas, provide reasonable access for maintenance staff, avoid sprinkler lines, conduit or additional building infrastructure in these areas.
30. Variable speed blower air handlers, are preferable for all new construction.
31. Where zone systems are incorporated into the HVA/C design equipment controls must be compatible with Metasys building control systems, U.N.O.

Section 15300 – Fire Sprinkler Criteria: To be provided upon request

1. Types of sprinkler systems required for various use groups such as classrooms, computer rooms, shops, etc. must be designed as outlined by NFPA and the local fire marshal.
2. Approved sprinkler head manufacturers and types: per Facilities Management
3. Fire pump system as defined by NFPA and the local fire marshal.
4. All fire sprinkler systems must be installed in compliance with NFPA and the local fire marshal requirements:

Section 15410 – Plumbing Fixtures (and Accessories)

1. Lavatories - All standard buildings & offices: American Standard Aqualyn, white with 4" centers Lav faucet: Sloan model #EBF-650-BDT battery powered. Lavatories will be mounted into composite material counter top open on bottom. Top manufacturer to cut lavatory openings in top to dimensions supplied by plumber. Color of top TBD by owner.

2. Mop sinks to be pre-molded stone type with wall mounted faucet with hose end, brace, and vacuum breaker with sink edges, Mop sink faucet shall be Wolverine brass model #93363, 8" wall mounted.
3. Sink – Dorms: American Standard Aqualyn. Dorm sink faucet shall be, Single lever handle faucet 4" center Wolverine Brass Model: Endurance cat #85200 with pop-up.
4. Public Restroom Sinks: American Standard Aqualyn, white with 4" centers. Lav faucet: Sloan model #EBF-650-BDT battery powered.
5. Kitchen Sinks: Elkay, Stainless Steel kitchen sink sized per bldg. With Single lever handle faucet 8" center Wolverine brass model; Endurance cat #85000, less spray. Three Compartment sink: Elkay Lustertone LTR Series 18 Gauge-Type 302-Self Rim Model #LTR-4622 Standard bowl depth 7 1/2"
6. Water Closets - Dorms only: American Standard Cadet Floor mount elongated white front toilet bowl. 1.6 GPF or equal (dorms only, non-ADA).
7. Water Closets: American Standard #AFWALL 3351.001 wall mount elongated white front toilet bowl, 1.28 GPF ADA compliant or equal with Sloan Optima Plus #8111-1.28 flush valve.
8. Wood white toilet seats.
9. Urinals – American Standard Maybrook low consumption, white, w/ Sloan Optima Plus #8186 urinal flush valve.
10. Shower valves will be Wolverine brass model Encore II cat #85651 with shut off valves on the valve. Shower valves to have temperature balancing and mixing valves
11. Hot water heaters will be A.O. Smith brand and circulating pumps will be Grundfos brand with stainless steel impellers. The domestic hot water will have a circulating pump and a return loop.
12. All domestic water supply piping will be copper.
13. All sinks on campus with angle stop shall use ¼ turn ball valve type angle stop with a separate supply line.
14. When called for all water circulation pumps used on domestic hot water systems need to be Grundfos commercial series with stainless steel bearings and impellers, model and size TBD upon application.
15. All new building water supply shall have pressure release valves, Watts #223 25-75, PSI 3" unless noted otherwise.
16. All back flow preventors shall be Zurn Wilkins (not a Clean Check backwater valve)
17. Drinking Fountains: To be Elkay EZS8S or EZS8STL8SC depending upon application.
18. Shower valves will be Wolverine brass model Encore II cat #85651 with shut off valves on the valve. Shower valves to have temperature balancing and mixing valves.
19. Showerhead: Wolverine Brass, Brass Shower Head #53671 1 3/4" face.
20. In all applications except residence halls, shower drain: Stainless steel strainer. Shower pans: 6"X6" glazed ceramic tile with curb on floor and glazed ceramic tile 6"X6" surround on wall from the floor to the ceiling full height. Color TBD by owner. Floor to be floated before tile is installed.
21. In residence hall shower applications showers will be cultured marble surround color TBD by owner.

Section 15500 - HVAC

1. Consult PM for input prior to and during the design of the mechanical systems.
2. Equipment will be commercial grade as manufactured by Trane or American Standard. Equipment will be a minimum 16 SEER or higher with variable speed blowers, economizers (with #BAYOSA001B module) and hail guards.
3. Thermostat:
Smaller Buildings and Flight Line: Trane Touch Screen #TCONT 800.

Larger Buildings and Academic areas where zone systems are incorporated into the HVA/C design: Metasys. Unitary Controller (AS-UNT111-1) Temperature Element TE-6700 Series Johnson Controls. Mechanical Engineer shall inquire the following before designing a system:

1. Building to be connected to the campus system, not stand-alone.
2. Graphics are not required.
3. Connection to campus fiber system is to be coordinated by IT and provided by contractor.

Section 15850 – Air Handling

1. Air handler blowers shall be sized for a 80% maximum blower speed is required to provide design air flows, velocities and pressures to minimize vibration and noise.
2. Ventilation standards shall be a minimum of 20 cubic feet per minute per occupant.

Section 15860 – Centrifugal Fans

1. In-line fans/blowers shall have **complete clearance at access panels** for service and maintenance.
2. Grease fittings shall be extended for easy access without the need for equipment shutdown.
3. Fans to be direct drive variable speed.

DIVISION 16: ELECTRICAL

Section 16000 – General

1. Each building will have a separate electric meter provided and installed by Contractor.
2. All work shall comply with the exterior lighting ordinances of the Local Government and with all requirements in the latest edition of the National Electrical Code (NEC), City of Prescott and requirements of the local power supplier.
3. All materials shall be new, Underwriter listed and standard first line products of their respective kinds.

Section 16050 – Basic Electrical Materials and Methods

1. In general, no more than six circuits shall be run in a single $\frac{3}{4}$ " homerun if conductors are #12's or smaller. Size of all homerun conduits shall be $\frac{3}{4}$ " minimum. Do not combine homeruns when shown separate. If conduit is greater than $\frac{3}{4}$ ", fill shall be no more than 40% as allowed by NEC.
2. Neutral conductors shall be #12 AWG minimum where two or more 15 or 20 amp circuits share a common neutral.
3. Conduit and Fittings:
 - a. Wiring of every description shall be in an approved raceway. Conduits will be sized in accordance with NEC fill ratio requirements no conduit will be smaller than $\frac{1}{2}$ " trade size.
 - b. Flexible Steel Conduits shall be used only for connection to equipment which is movable for adjustment, mounted on isolation units for elimination of vibration and sound, or for connection from a close-by junction box to lay-in type light fixtures in a "T" grid ceiling. Run green ground wire in all flexible conduits. Seal tight flex shall be applied spirally wound steel.
 - c. Type "MC" cable shall not be used without the specific written acceptance by the Owner. If allowed by the Owner, the minimum size wire shall be #12.
 - d. No conduit shall be run exposed in finished areas without specific written acceptance by the Owner. Surface mounted conduit or wire-mold is not acceptable, unless specifically approved by owner. If approved by owner all surface conduit will be Rigid steel or IMC with threaded fittings and appropriate straps.
 - e. EMT conduit shall be used in all areas except under slab or encased in concrete strapped and supported per NEC requirements. EMT fittings shall be compression type only and hand tightened with two wrenches on either side of fitting.
 - f. PVC conduit will be used under slab and encased in concrete. All fittings will be primed and then glued with grey electric PVC cement. Conduit stubbed up/down or through floor slabs shall be 20 mil wrapped RGS (rigid / steel) or 20 mil wrapped IMC with a minimum of 6" conduit exposed out of slab for connection of threaded or compression fitting. Conduit bend shall not extend out of top of slab.
 - g. ENT (smurf pipe) is not approved for use anywhere in any application without specific written permission by the owner.
4. Boxes:
 - a. All boxes will be 4" square steel as manufactured by Raco or equal.
 - b. All mud-rings will be steel in the appropriate ganged configuration and sized to the depth of the wall finish Raco or equal.
 - c. Floor boxes will be Hubble PFB1 box with PFBA1 ring, S3925 flap, and S3182 flange.
 - d. All exterior boxes will be rated rain-tight or weatherproof Hubble or equal.
 - e. Underground J-boxes will be concrete with extensions for proper depth to finished grade. Locking concrete lids with tamperproof screws marked "Electric" in all areas except those exposed to traffic will be locking steel and marked "Electric".
5. Telephone plates and devices or jacks (modular) shall match electrical device plates and devices, in color and material, and will comply with campus standard Systemax components. Wall plates to match wall color where possible, verify with PM.

6. Different systems shall be run in separate conduits as complete systems with conduit, wire-ways, boxes, etc... Examples of separate systems are as follows: 120/208 volts, 277/480 volts, fire alarm, emergency lighting and power, computer / telephone, intrusion alarms, building automation and energy management. Electrical wires, electronic wires and air lines shall not be run in the same conduit. Control wiring of different voltages for the wiring of electrical equipment shall not be run in the same conduit as power feeders.
7. All power wiring shall be in conduits or raceways regardless of voltage.
8. All main service, main feeder and general circuitry wiring shall be specified as copper.
9. Telephone, communication cabling and power limiter cable for fire alarm systems shall be in a conduit system unless the cable is plenum rated.
10. Sleeves shall be specified for penetration through floor and through firewalls. Sleeves shall extend a minimum of 4" AFF (above finished floor) and/or extend a minimum of 6" beyond each wall surface. Fireproofing shall be provided for all penetrations.
11. All electrical equipment, disconnects, starters, panels, devices and plates shall be installed plumb and true. All adjacent boxes shall be aligned and level. Devices will be installed with enough clearance and access to comply with National Electrical Code, to allow for maintenance, repairs and/or calibration.
12. All Panel boards, disconnects and starters shall be mounted at a height to make testing and maintenance as easy as possible. In no case shall panel boards be mounted so that the maximum height of any circuit breaker exceeds 78" to top of breaker. For panel boards with excessive height, mount panel board so that the bottom of the cabinet will not be less than 12" above the finished floor.
13. Conductor splices shall only be allowed in outlet boxes, gutters, junction boxes or pull boxes as allowed by National Electrical Code.

Section 16140 – Wiring Devices

1. Motion sensing switches shall be specified for all Labs, toilet rooms, classrooms, offices, conference rooms, work rooms, storeroom type spaces and any other heavy use areas. Motion sensors shall be of the infrared or ultra-sonic type controlled by EMS (if applicable); Toilet rooms shall be equipped with motion sensing switches for both lights and fans controlled by EMS (if applicable).
2. Motion sensing switches:
 - a. Wall: Leviton ODS-15ID
 - b. Ceiling: Leviton ODCOS-11W
3. Toggle: industrial specification grade, side wired, 20 amps, 120/277 volts, white or almond TBD by application, Hubbell 1221 or equal.
4. Momentary contact: 3-position single pole throw, match face plate, Hubbell #1557 or equal.
5. Lighted toggle: clear, Hubbell #1221, ILC or equal.
6. Pilot toggle: clear, Hubbell #1221, PLC or equal.
7. All switches to have body securely locked to bridge by staked screw assembly. Back wire through a hole with clamp type wiring assembly suitable for stranded wire.
8. Lighted toggle switches shall be used in all tunnels and equipment rooms so switch locations will glow in the dark. Lighted toggle switches shall be white or clear, not red or ivory.
9. Receptacles shall be industrial specification grade, side wired, 20 amps, 120/277 volts, white or almond TBD by application, Hubbell or equal.
10. GFCI Duplex receptacle 120 volt, 20 amp, Leviton model #6899, in color TBD by application.
11. Cover plates in exposed wiring to be steel rounded to box edge. Oversized plates are not acceptable. Wall switches shall be on the latching side of doors according to the architectural plans. All switches shall be 48" high to the bottom of the switch, except where located in cabinets, see details.
12. Switch and receptacle plates shall be nylon as manufactured by Pass and Seymour, data port covers shall be campus standard Systemax. Verify color with owner. Standard Interior wall color: SW6000 Snowfall, white plates, Standard offices Interior wall color: SW6099 Sand Dollar, almond plates, Motion sensor covers are almond, provided my Pass and Seymour (manufacture).

Section 16300 – High Voltage Distribution (Above 600 volts)

1. Each new building shall provide the necessary switches and transformers for its connected load.
2. All High voltage wiring and equipment will meet Arizona Public Service (APS) requirements.
3. High voltage switchgear shall be pad mounted, low profile, dead front type, tan finish as manufactured by S&C Electric Company with Cooper Power Systems X-Limiter Full Range Current-

limiting Fuses (15.5kV, amp size as required) on branch feeder sections and fault indicators located on the feeder sections.

4. High voltage cable shall be #1/0 solid (branch feeder) or #750 kcmils (service feeder) AL 1-C 15 kV or 21kV .220 mills "TRXLPE" with concentric neutral, jacketed. LoadBreak Elbows Connectors 200A, 15kV. Approved alternate: High voltage cable shall be #1/0 solid or #750 kcmils AL 1-C 15 kV .220 mills 133% insulation "XLPE" with concentric neutral, jacketed. LoadBreak Elbows Connectors 200A, 15kV. Written approval from University Construction & Planning must be received to use this alternate. (associated costs to be considered)
5. All wire shall be installed in conduit no direct buried wire is allowed. Wiring shall be installed using wire lubricant approved for the purpose.
6. Provide 15kV Metal Oxide Varistor Elbow Surge Arresters at each transformer.
7. All terminations shall meet APS specs.
8. All underground conduits shall be DB120 PVC with 36" minimum bell to bell sweeps.
9. All exposed above ground conduits will be galvanized rigid steel.
10. Conduits will be proven, cleaned, installed with a pull tape and sealed.

Section 16320 – Transformers

1. Service transformers shall be three phase pad mounted, dead front loop feed, oil filled (non-PCB), air cooled, 95kV BIL, Bay-o-net current-limiting oil immersed fusing as manufactured by Cooper or equal. Transformer shall be located at exterior service side of building for accessibility.
2. Captive Pentahead bolt shall be used on transformer door (Penta head socket to be turned over to FMD when job is complete).
3. Transformers shall not be located in basements or other areas subject to contaminant by floodwaters.

Section 16400 - Service & Distribution (600 volts and below)

1. All service entrance sections and switchboards shall have copper buss. Distribution panel, MCC and branch circuit panel-board busses shall be aluminum. All enclosures shall be field punched. Pre-punched knockouts are not approved.
2. All switchgear shall be specified as General Electric.
3. Panic buttons shall be installed in each electrical service entrance switchboard room at the exits. These panic buttons shall be wired to a shunt trip main breaker in parallel with the ground fault trip. The buttons shall be Allen Bradley #800T-BGA (or approved equal) extended head red push-button units with Allen Bradley #800-N13 (or approved equal) extra-long guard ring. These panic buttons are to be marked EMERGENCY POWER OFF SWITCH" by a red and white laminate label. Mushroom head pushbuttons are not acceptable.
4. All panel-boards shall have bolt on circuit breakers and door-in-door construction. Load centers and plug-in breakers are not approved.

Section 16420 – Service Entrance

1. Service entrance switchboards shall be provided with digital multiple meter with amp, volts, kilowatt-hour, kilowatt demand, power factor and harmonics, and shall meet APS EUSRC requirements. Meter shall have the capacity to communicate with owner's EMCS system.
2. All service entrance sections rated above 200 Amps will require a HI-Pot test before being energized provide written report results to PM.
2. Label switchboards with CT ratios.
3. Provide an equipment ground from main grounding electrode, gas and cold water pipe, and sized per NEC, to all electrical distribution equipment.
4. All conductors used for grounding will be color-coded green continuously in all visible places, cabinets, equipment, pull boxes, junction boxes, switchboards, etc., or shall be bare copper continuously.
5. Conductors used for isolated grounds shall be green with orange stripe or tracer.

Section 16480 – Motor Control

1. Motors shall have disconnecting means furnished by the Contractor. General Electric or Square D are approved manufacturers. Magnetic starters shall be installed on motors 1 hp or larger (controls to be 120 volt). Magnetic starters shall have green and red pilot lights, in covers. All switches to be HD heavy-duty rated.

2. All magnetic switches to have one overload relay per phase.
3. Single-phase motors are to be protected with fuses.

Section 16490 – Low-Voltage Distribution Components and Accessories

1. All fuses shall be Allen Bradley Bulletin 600 or Fusetron fuses.

Section 16500 - Lighting

1. Interior lighting shall be designed to the maximum efficiency incorporating energy saving fixtures and day lighting when possible.
2. Target range for lighting electrical consumption should be no more than 1.5 watts/s.f. 2X4 troffer lights w/ electronic ballasts. E.S. w/ parabolic diffusers.
3. Interior surface fixture 2'x4', T-8 fluorescent, low profile wrap around, elec. ballast, Lithonia #LB428120
4. Interior recessed troffer fixture in Corridors, Offices, Classrooms, Labs, heavy Computer areas three light T8 120V single electronic ballast 18 cell 3" deep brushed anodized aluminum louvers 2x4 troffer. Fixture: Lithonia 2PM3NGB332 18 LS 120 GEB
5. Cove or architectural lighting in Lobbies, Atriums, Executive Conference Rooms, etc. may be used with owner's approval.
6. Lighting in Classrooms/Labs; controlled by one level motion sensing device.
7. Interior light fixture for Gymnasiums, sport facilities, convention centers, labs, warehouses: Lithonia fluorescent high bay with electronic ballast, fixture type and design TBD by architect and engineer for the application.
8. Typical workstation desk tops to have the minimum foot-candle count as possible.
9. Exit sign, red LED battery back-up Lithonia model #LQMSW3R120/277ELN
10. Emergency two head light fixture, Lithonia model #ELM2, 120/277 volt, 12 watt, smooth white

Section 16501 - Lamps

1. Interior fluorescent lamps shall be F28T8 41K General Electric, Westinghouse, Phillips, Sylvania or equal.
2. Lamps for exterior fixtures will be sized accordingly in HPS General Electric, Westinghouse, Phillips, Sylvania or equal.

Section 16502 – Ballasts & Accessories

1. Fluorescent fixtures shall be provided with fully electronic ballasts. All ballasts shall be rapid start with total harmonic distortion less than 20%. Power factor: 95% minimum, lamp current crest factor – 1.6 or less, sound rating "A", parallel operation required, minimum five year material and labor replacement warranty. Specify: Valmont Ultramizer, Advance, Motorola, EBT, Magnitek, Triad, or approved equal.

Section 16530 – Site Lighting

1. All exterior lighting shall meet the requirements of the local lighting ordinances (dark sky, etc.)
2. All exterior entries illuminated by light fixtures attached to the building. Minimum wire size shall be #10. All wire to be stranded.
3. Exterior building lights Exterior Building Mounted Light Fixture: Architectural Surface-Mounted H.I.D. #613-050NLXL, Black, Exceline, 50 HPS, PC, wall mounted with wire guard (meets City of Prescott night sky ordinance)
4. Provide site lighting as required.
5. Provide photocell sensors for exterior lighting.
6. Exterior walkway lights are: ExceLine Site Master Roadway Series Horizontal Lamp Cutoff Luminaire Model #: SMR 15 4 LX 8 = SMR 15 (150(E/BT/ED28) 4 (Distribution) LX (Source) 8 (Voltage 120/277)
7. Exterior parking lot lights: ExceLine Site Master Roadway Series Model # SMR 40 4 LX 8 SMR 40 (400(ED/ET18)
8. Walkway and Parking Lot Poles: Design 101 Square Straight Steel Poles 4"x4" up to 25 Ft. 5"X5" 26-40 Ft. Color: Black
9. Residence halls only bollards may be used: Hadco #CLV82 Color: Black No bollard lighting anywhere else except by written authorization from PM.
10. Emergency lighting at exterior of building to be Lithonia #AFN DB EXT

11. Emergency Phones: PLC-7 Stainless Triangle Column (MB) w/ RR7331/1 phone installed in unit – 2button auto dial w/ 2" button with silk screen phone panel @ no.

See EXHIBIT II: ERAU Prescott Campus Standardized Wiring Requirements.

All Information Technology / Special Systems shall follow IT "Standardized Wiring Requirements for New Construction and Renovations" document located at
<http://stats.pr.erau.edu/maps/PRCwiring.doc>

End of Document

SECTION 01 11 00

SUMMARY OF WORK

1.01 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project: Project consists of the selective demolition and new improvements to the Athletic Complex, Buildings 80 and 83, at Embry-Riddle Aeronautical University, Prescott, Arizona.
- B. Base Bid: The bid shall include labor, material, equipment, services and transportation necessary for the construction of the Project.

1.02 DEFINITIONS PERTAINING TO THE CONTRACT DOCUMENTS

- A. Furnish: To purchase and deliver.
- B. Install: To place into final position and connect.
- C. Provide: To furnish and install.
- D. Connect: To make the complete necessary utility connection (water, sewer, gas, electricity, etc.) from the building utility to the piece of equipment to allow that piece of equipment to function as intended (e.g., a gas connection for an oven or cooktop).
- E. "As shown", "as detailed", "as indicated" or words of similar import mean as indicated on the drawings
- F. "As selected", "as approved" or words of similar import mean as selected by, as approved by, or as accepted by the Architect and Owner.
- G. "Approved equal", "or equal" shall mean as approved and accepted by the Architect and Owner.
- H. "Shall" means mandatory.
- I. "As required" means as required by the contract documents.
- J. "As necessary" means essential to the completion of the work.
- K. "Concealed" means not visible in the finished work.
- L. "Exposed" means visible in the finished work.
- M. "Days" means calendar days.
- N. "Working Days" means work days and does not include legal holidays.
- O. Substantial Completion: That stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

1.03 OWNER FURNISHED AND INSTALLED ITEMS

- A. General: The terms "Furnish," "Install," and "Connect" shall be as defined in Article 1.02 of this Section.
- B. Items furnished and installed by Owner: Refer to Drawings for items to be Owner Furnished and Installed. Items include, but are not limited to, the following:
 - 1. Storage Lockers.
 - 2. Washer and Dryer.
 - 3. Scoreboard.
 - 4. Site accessories (fixed table and chairs).
 - 5. Gymnasium bleachers.
- C. Contractor's Responsibilities:
 - 1. Contractor shall give Owner written notice, stating date(s) when Owner-Furnished items must be received at the job site to insure Project completion in accordance with established schedule. Such dates shall be shown on the schedule.
 - 2. Contractor is responsible for the coordination and interface of Owner-Furnished and Installed items with Work of this Contract to provide all necessary mechanical and electrical rough-ins, openings, supports, dimensions, etc., as necessary for a complete installation.

1.04 OWNER-FURNISHED CONTRACTOR INSTALLED ITEMS

- A. General: The terms "Furnish," "Install," and "Connect" shall be as defined in Article 1.02 of this Section.
- B. Items furnished by Owner and installed by Contractor: Refer to Drawings for items to be Owner Furnished for Installation by Contractor.
- C. Owner's Responsibilities:
 - 1. Arrange for and deliver Owner reviewed Shop Drawings, Product Data, and Samples, to Contractor.
 - 2. Arrange and pay for product delivery to site.
 - 3. On delivery, inspect products jointly with Contractor.
 - 4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
 - 5. Arrange for Manufacturers' warranties, inspections and service.
- D. Contractor's Responsibilities:
 - 1. Contractor shall provide a written schedule to the Owner, indicating when Owner-furnished items must be received at the job site to insure Project completion in accordance with established schedule. Such dates shall be shown on the schedule.
 - 2. Review Owner-reviewed Shop Drawings, Product data, and Samples
 - 3. Receive and unload products at site; inspect for completeness or damage, jointly with Owner.
 - 4. Handle, store, assemble, install, protect, connect and finish such products, including furnishing lubricants and fluids and procedures necessary to render product serviceable and operative.
 - 5. Contractor is responsible for the coordination and interface of Owner-Furnished items to provide all necessary mechanical and electrical rough-ins, openings, supports, dimensions, etc., as necessary for a complete installation.

1.05 CONTRACTOR USE OF SITE

- A. General: The Contractor will have limited use of the existing site outside of Contract Limit Lines indicated. The Contractor will have full use of the site within the Contract Limit Lines indicated for construction operations during the construction period except as may be limited by noise and vibratory work which will be restricted to certain times. Special care shall be taken to secure the site within the Contract Limit Lines to prevent access by employees and public.
 - 1. All work in areas where construction activities must encroach beyond the Contract Limit Lines, it is the Contractor's responsibility to coordinate in advance with the Owner's representatives to ensure the safety of the existing facility and facilities' occupants.
- B. Owner Operations:
 - 1. Embry-Riddle Aeronautical University will be open and operating during the entire course of construction, including areas immediately adjacent to Contract Limit Lines of this Work. Contractor use of the facility will be limited to areas within Contract Limit Lines indicated for construction operations during the construction period.
 - 2. At no time during the work shall Contractor place, or cause to be placed, materials or equipment, or other items, at a location which would impede or impair access to or from the present facilities for customers, employees or delivery personnel.
 - 3. The Contractor shall cooperate with the Owner and conduct his work so as to insure the least possible obstruction to traffic and inconvenience to employees, students, public and facility operations, and to insure the protection of persons and property. Do not obstruct access to fire hydrants, fire extinguishers, or fire control stations.
 - 4. Contractor shall cooperate with the Owner in providing traffic control during course of construction in order to minimize inconvenience to employees, students, and public.
 - 5. The Contractor shall be responsible for all pedestrian traffic control, including signs, barricades, enclosures, etc., as may be required.

1.06 PERMITS, FEES AND NOTICES

- A. Plan check and Building Permit fees have been paid by the Owner.
- B. The Contractor shall secure the building permit and other permits and governmental fees, licenses and inspections necessary for the proper execution and completion of the Work which are customarily secured after execution of the Contract and which are legally required at the time the bids are received or negotiations concluded. This shall include, but not be limited to:
 - 1. Building Permit from the City of Prescott, Arizona.
- C. The Contractor shall comply with and give notices required by laws, ordinances, rules, regulations and lawful orders of public authorities bearing on the performance of the Work.
- D. It is not the responsibility of the Contractor to make certain that the Contract Documents are in accordance with applicable laws, statutes, building codes and regulations. If the Contractor observes that any of the Contract Documents are at variance therewith in any respect, he shall promptly notify the Architect and Owner in writing, and any necessary changes shall be accomplished by appropriate Modification.

- E. If the Contractor performs Work knowing it to be contrary to such laws, ordinances, rules and regulations, including, but not limited to the following, and without such notice to the Architect and Owner, the Contractor shall assume full responsibility therefore and shall bear attributable costs.
 - 1. Codes, Ordinances, Rules and Regulations.
 - a. 2006 International Building Code.
 - b. 2006 International Electrical Code.
 - c. 2006 International Mechanical Code.
 - d. 2006 International Plumbing Code.
 - e. 1990 Americans with Disabilities Act (ADA).
 - f. ICC / ANSI 117.1 – 2009 (includes ramp slopes, mounting heights, wheelchair clearances, door clearances, slip resistance for floors, stairs and ramps, opening/operating force for doors, sill heights, etc.).
 - g. 2010 ADA Accessibility Guidelines (ADAAG).

1.07 SPECIAL SITE CONDITIONS

- A. The Contractor shall be completely responsible for protecting existing buildings, access routes, and site improvements indicated to remain and adjacent to new construction from damage and/or injury due to this Work and shall repair at his expense and to the Architect's satisfaction, all areas damaged as a result of his Work.

1.08 APPROVED APPLICATORS

- A. Where specific instructions in the Specifications require that a particular product and/or material be applied and/or installed by an "approved applicator" it shall be the Contractor's responsibility to insure that any Subcontractor or Subsubcontractor used for such Work is in fact currently certified by the particular Manufacturer for this type of installation or application.

1.09 APPROVED MANUFACTURERS

- A. Each Section includes a list of Manufacturers whose equipment is acceptable as to manufacture, subject to conformance with the Contract Documents. Careful checking must be made by the Contractor and the manufacturer or equipment supplier to verify that the equipment will meet all capacities, requirements, space allocations and is suitable to the intended purpose.

1.10 REFERENCE DATA

- A. Reference data made available to the Contractor is for the Contractor's information only, and neither the Owner nor the Architect assumes any responsibility for the Contractor's conclusions.
- B. The Contractor shall establish and maintain all buildings and construction grades, lines, levels, and bench marks. This Work shall be performed by a licensed Civil Engineer or Surveyor under the employ of the Contractor, who shall certify to the Architect that he has performed this service.
- C. The Contractor shall not remove any property line markers or monuments or data established by the Owner.

1.11 ARCHITECTURAL BARRIERS

- A. It is the desire of the Owner that the facilities and improvements constructed under this Contract meet or exceed the intent of applicable public law concerning prohibition of discrimination, and that no individual be discriminated against on the basis of disability in the full and equal enjoyment of the goods, services, facilities, privileges, advantages, or accommodations of this completed Project.
- B. The designers and drafters of these Documents have intended to incorporate those Owner's intentions into these Documents.
- C. It is recognized that there may be products not incorporated into these Documents that may more nearly meet the Owner's desires than those included.
- D. The Owner hereby solicits those providing elements of this Project to bid and contract for the Project as required by these Documents, but at the time of submitting Shop Drawings, or sooner when appropriate, and without causing delay in the Project, to also submit proposals for improving the accessibility of the Project to physically or mentally impaired persons.

1.12 REPRODUCTION OF DRAWINGS

- A. Contractor shall not alter the size of Drawings when making or ordering reproductions.
- B. Only full-size, current Drawings shall be maintained at the Project Site.

1.13 COMMUNICATIONS

- A. All communications with the Architect shall be copied to the Owner's Representative.
- B. All communications with the Architect's consultants shall be through the Architect.

END OF SECTION

SECTION 01 26 13

REQUESTS FOR INTERPRETATION

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Administrative requirements for requests for information / interpretation.

1.02 DEFINITIONS

- A. Request For Information / Interpretation (RFI):
 - 1. A document submitted by the Contractor requesting clarification of a portion of the Contract Documents, hereinafter referred to as RFI.
 - 2. A properly prepared request for information / interpretation shall include a detailed written statement that indicates the specific Drawings or Specification in need of clarification and the nature of the clarification requested.
 - a. Drawings shall be identified by drawing number and location on the drawing sheet.
 - b. Specifications shall be identified by Section number, page and paragraph.
 - 3. Requests for Information: Request made by Contractor concerning items not indicated on Drawings or contained in the Project Manual that is necessary to properly perform the Work.
 - 4. Requests for Interpretation: Request made by Contractor in accordance with Owner's Representative's third party obligations to the contract for construction.
- B. Improper RFI's:
 - 1. RFI's that are not properly prepared.
 - 2. Improper RFI's will be processed by the Architect at the Architect's standard hourly rate and Architect will charge the Owner, and such costs will be deducted from monies still due the Contractor. The Contractor will be notified by the Architect prior to the processing of improper RFI's.
- C. Frivolous RFI's:
 - 1. RFI's that request information that is clearly shown on the Contract Documents.
 - 2. Frivolous RFI's may be returned unanswered or may be processed by the Architect at the Architect's standard hourly rate and Architect will charge the Owner, and such costs will be deducted from monies still due the Contractor. The Contractor will be notified by the Architect prior to the processing of frivolous RFI's.

1.03 CONTRACTOR'S REQUESTS FOR INFORMATION

- A. RFI's shall be submitted on Document 00 63 13 included in the Project Manual, or similar form prepared by the Contractor and approved by the Architect prior to use.
 - 1. Forms shall be completely filled in, and if prepared by hand, shall be fully legible.
 - 2. RFI's shall be submitted in numerical order with no breaks in the consecutive numbering.
 - 3. Each page of attachments to RFI's shall bear the RFI number and shall be consecutively numbered in chronological order.

4. RFI's shall be submitted by E-Mail or digital file transfer.
 - a. Address for E-Mail will be distributed by the Architect at the Pre-Construction Conference.
 - b. An electronic version of Document 00 63 13 will be provided upon request.
- B. When the Contractor is unable to determine from the Contract Documents, the material, process or system to be installed, the Architect shall be requested to make a clarification of the indeterminate item.
 1. Whenever possible, such clarification shall be requested at the next appropriate Project Meeting, with the response entered into the meeting minutes. When clarification at the meeting is not possible, either because of the urgency of the need, or the complexity of the item, Contractor shall prepare and submit an RFI to the Architect.
 2. RFI's may not be sent directly to the Architect's Consultants. All RFI's shall be sent directly to the Architect.
- C. Contractor shall endeavor to keep the number of RFI's to a minimum. In the event that the process becomes unwieldy, in the opinion of the Architect, because of the number and frequency of RFI's submitted, the Architect may require the Contractor to abandon the process and submit future requests as either submittals, substitutions or requests for change.
- D. RFI's shall be originated by the Contractor.
 1. RFI's from subcontractors or material suppliers shall be submitted through, reviewed by, and signed by the Contractor prior to submittal to the Architect.
 2. RFI's from subcontractors or material suppliers sent directly to the Owner's Representative, Architect or the Architect's consultants shall not be accepted and will be returned unanswered.
- E. Contractor shall carefully study the Contract Documents to assure that the requested information is not available therein. RFI's which request information available in the Contract Documents will be deemed either "improper" or "frivolous" as noted above.
- F. In cases where RFI's are issued to request clarification of coordination issues, for example, pipe and duct routing, clearances, specific locations of work shown diagrammatically, and similar items, the Contractor shall fully lay out a suggested solution using drawings or sketches drawn to scale, and submit same with the RFI. RFI's which fail to include a suggested solution will be returned unanswered with a requirement that the Contractor submit a complete request.
- G. RFI's shall not be used for the following purposes:
 1. To request approval of submittals
 2. To request approval of substitutions,
 3. To request changes which are known to entail additional cost or credit. (A Change Order Request form shall be used.)
 4. To request different methods of performing work than those drawn and specified.
- H. In the event the Contractor believes that an RFI response by the Architect results in additional cost or time, Contractor shall not proceed with the work indicated by the RFI until a Change Order (or Construction Change Directive, if applicable to the Project) is prepared and approved. RFI's shall not automatically justify a cost increase in the work or a change in the Project schedule.
 1. Answered RFI's shall not be construed as approval to perform extra work.
 2. Unanswered RFI's will be returned with a stamp or notation "Not Reviewed".

- I. Contractor shall prepare and maintain a log of RFI'S, and at any time requested by the Architect, Contractor shall furnish copies of the log showing outstanding RFI'S. Contractor shall note unanswered RFI's in the log.
- J. Contractor shall allow up to 5 working days review and response time for RFI'S, unless review is required of multiple consultants, then the review and response period shall be 7 working days.
 - 1. The Architect will endeavor to respond to RFI's in a timely manner.
 - 2. RFI shall state requested date/time for response, however, this requested date/time for response is not a guarantee that the RFI will be answered by that date/time if that date/time is too expeditious.
 - 3. Architect may request additional time when deemed necessary.

1.04 ARCHITECT'S RESPONSE TO RFI'S

- A. Architect will respond to RFI's on one of the following forms:
 - 1. Answers to properly prepared RFI's will be made directly upon the RFI form and will be returned via E-Mail or digital file transfer.
 - 2. Improper or Frivolous RFI's
 - a. Notification of Processing Fee(s).
 - b. Unanswered RFI's will be returned with a stamp or notation: "Not Reviewed."
- B. Architect may opt to retain RFI's for discussion during regularly scheduled project meetings for inclusion of responses in meeting minutes in lieu of responding on a written form.

END OF SECTION

SECTION 01 29 00

PAYMENT PROCEDURES

1.01 SCHEDULE OF VALUES

- A. With first Application for Payment, submit three (3) copies of completed AIA Document G703 Continuation Sheet indicating the scheduled value of major categories and subcontracts for the Work, for approval of the Architect.
- B. For each item, provide a column for listing:
 - 1. Item number
 - 2. Description of Work
 - 3. Scheduled Value
 - 4. Previous Applications
 - 5. Work in Place and Stored Materials under this Application
 - 6. Authorized Change Orders
 - 7. Total Completed and Stored to Date of Application
 - 8. Percentage of Completion
 - 9. Balance to Finish
 - 10. Retainage.

1.02 PAY REQUEST

- A. The form of Application for Payment shall be a notarized AIA Document G702, Application and Certification for Payment, supported by approved AIA Document G703, Continuation Sheet. A minimum of three (3) original copies of these forms shall be submitted for each application. Submit additional copies if requested by the Owner or Architect.
 - 1. Present required information in typewritten form or on electronic media printout.
 - 2. Execute certification by signature of authorized officer.
 - 3. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.
 - 4. List each authorized Change Order as an extension on continuation sheet, listing Change Order number and dollar amount as for an original item of Work.
- B. With each Application for Payment submit lien releases for the previous payment, substantiation for stored materials, monthly progress reports and updates, and any other pertinent items required by the Owner or Architect and identified during the Pre-Construction Conference.
 - 1. AIA Documents G706, Contractor's Affidavit of Payment of Debts and Claims, G706-A, Contractor's Affidavit of Release of Liens, Documents G707, Consent of Surety Company to Final Payment shall be used.
 - 2. If appropriate, G707-A, Consent of Surety to Reduction in or Partial Release of Retainage shall be used.
- C. When acceptable to the Owner, the Contractor may submit for payment on properly stored materials not yet incorporated into the work. Materials stored on the site must be in a secured area and be protected from damage, weather, theft or vandalism. The Contractor shall be responsible for replacing any damaged or missing materials.
- D. Materials stored off the job site must be in the supplier's storage area, separated from other materials, and clearly labeled for this particular project. Insurance certificates for the material naming the Owner as an additional insured, loss payee shall be delivered with the pay request.

END OF SECTION

SECTION 01 31 19

PROJECT MEETINGS

PART 1 GENERAL

1.01 PRECONSTRUCTION CONFERENCE

- A. A Preconstruction Conference to discuss the Project work will be held at a time and location designated by the Architect.
- B. Contractor, and representatives of major Subcontractors, shall meet with Owner and Architect. The purpose of this conference is to discuss the Project in detail, including scheduling of Work, and to answer questions. Unless followed up in writing, verbal authorizations or acknowledgement of those present are not binding.
- C. Meeting minutes will be taken by the Contractor for distribution to all attendees within 48 hours of conference.

1.02 PROGRESS MEETINGS

- A. At time(s) designated by Architect or Owner, short weekly Progress Meetings will be held at the Project site.
- B. Contractor and representatives of major Subcontractors shall meet with Owner and occasionally with Architect.
- C. Contractor is responsible for notifying Subcontractors of their required attendance. These meetings will address progress of the Work and problems that may have developed since the previous meeting.
- D. Unless followed up in writing, verbal authorizations or acknowledgements by those present are not binding.
- E. Meeting minutes will be taken by the Contractor, for distribution to all attendees within 48 hours of each meeting.

END OF SECTION

SECTION 01 33 00

SUBMITTALS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes administrative and procedural requirements for submittals required for performance of the Work, including the following:
 - 1. Construction Schedule.
 - 2. Material Delivery Schedule.
 - 3. Submittals, including:
 - a. Shop Drawings.
 - b. Product Data.
 - c. Samples.
 - 4. Reference Standards.
 - 5. Quality Control Submittals.
 - 6. Custom and Unique Tools, Equipment and Software.
 - 7. Submittals Schedule.
 - 8. Close-Out Documents, including:
 - a. Owner's Manual
 - b. Operations and Maintenance Data
 - c. Spare Parts
 - d. Guarantees and Warranties
 - e. As-built drawings.

1.02 SUBMITTAL PROCEDURES

- A. General: Electronic copies of digital files of the Construction Documents may be made available by Architect for Contractor's use in preparing Submittals. The Architect shall not be obligated to make available nor shall the Contractor be obligated to use such documents in submittal preparation.
 - 1. The use of digital files prepared by the Architect in the preparation of Shop Drawings shall not in any way obviate the recipient's responsibility for the proper checking and coordination of dimensions, details, member sizes and gauge, quantities of materials, and all other conditions as required to facilitate complete and accurate fabrication and erection.
 - 2. Transfer of digital files from Architect to Contractor shall be subject to the Terms and Conditions of a digital Files Transfer Agreement at the time of such transfer.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - 3. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

- C. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal.
1. Initial Review: Allow 14 calendar days for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Concurrent Review: Where concurrent review of submittals by Architect's consultants, Owner, or other parties is required, allow 21 days for initial review of each submittal.
 3. Direct Transmittal to Consultant: Only upon written permission by the Architect. Submittal will be returned to Architect before being returned to Contractor.
 4. If intermediate submittal is necessary, process it in same manner as initial submittal.
 5. Allow 14 calendar days for processing each resubmittal.
 6. No extension of the Contract Time will be authorized because of failure to transmit submittals adequately in advance of the Work to permit processing.
- D. Identification: Place a permanent label or title block on each submittal for identification. Submittals prepared utilizing the Architect's title block will be returned unreviewed.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
 2. Provide a space approximately 4 by 5 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
 3. Include the following information on label for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name and address of Contractor.
 - e. Name and address of subcontractor.
 - f. Name and address of supplier.
 - g. Name of manufacturer.
 - h. Unique identifier, including Specification Section number followed by a two (2) digit identifier. Resubmittals shall be noted with the same number followed by a unique revision identification number, eg. 01 33 00.01 R1. Submittals improperly identified will be returned without action.
 - i. Number and title of appropriate Specification Section.
 - j. Drawing number and detail references, as appropriate.
 - k. Other necessary identification.
- E. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals in green ink. Submittals received with mark-ups in other colors will be returned unreviewed.
- F. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a separate transmittal form. Unless otherwise provided, the Architect will return submittals received from sources other than Contractor without review.
1. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements of the Contract Documents, including minor variations and limitations. Include the same label information as the related submittal.

2. Include Contractor's certification stating that information submitted complies with requirements of the Contract Documents.
 3. Combine required material for a single item into a single submittal. Include Shop Drawings(s), Samples and Product Data for each. Incomplete or partial submittals will be returned without action for resubmittal in proper form, unless other arrangements are made with the Architect.
- H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- I. Use for Construction: Use only final submittals with mark indicating action taken by Architect in connection with construction.
- J. Maintain one (1) set of all approved submittals at the Contractors field offices at the Project Site.

1.03 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

- A. Shop Drawings: Submit newly prepared information drawn accurately to scale.
1. Do not reproduce Contract Documents or copy standard product information as the basis of Shop Drawings. Any Shop Drawings so prepared will be returned without action.
 2. Standard information prepared without specific reference to the Project is not a Shop Drawing.
 3. Preparation: Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates and similar information. Include the following, as applicable:
 - a. Dimensions.
 - b. Identification of products.
 - c. Fabrication and installation drawings.
 - d. Roughing-in and setting diagrams.
 - e. Wiring Diagrams. Differentiate between manufacturer-installed and field-installed wiring showing field-installed wiring, including power, signal, and control wiring.
 - f. Shop work manufacturing instructions.
 - g. Templates and patterns.
 - h. Schedules.
 - i. Design calculations.
 - j. Compliance with specified standards.
 - k. Notation of coordination requirements.
 - l. Notation of dimensions established by field measurement.
 4. Following Contractor's review and approval, submit six (6) paper copies to the Architect of each Shop Drawing for review.
 5. The Architect will review the Shop Drawings and affix a stamp indicating the findings of the review, and will return three (3) copies to the Contractor.
 6. Comments, if any, will be noted directly on the submittal.
 7. The Contractor shall then distribute as required.
 8. If a Shop Drawing is indicated to be corrected and resubmitted, the Contractor shall correct and resubmit as outlined above in a timely manner so as to not delay the Project.
 9. Fire Alarm System/Fire Sprinklers System Shop Drawings shall be submitted to the state and local Fire Marshal whose approval shall be obtained prior to submittal to Architect.

- B. Product Data: Following Contractor's review and approval, submit to the Architect a digital copy of Manufacturer's catalogs and brochures as required by the Specifications. Resubmit corrected copy for approval in accordance with original submittal.
1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each submittal to show which products and options are applicable. Unmarked Submittals will be returned without action.
 3. Include the following information, as applicable:
 - a. Manufacturer's written recommendations.
 - b. Manufacturer's product specifications.
 - c. Manufacturer's installation instructions.
 - d. Color charts.
 - e. Manufacturer's catalog cuts.
 - f. Wiring diagrams showing factory-installed wiring.
 - g. Printed performance curves.
 - h. Operational range diagrams.
 - i. Mill reports.
 - j. Standard product operating and maintenance manuals.
 - k. Compliance with recognized trade association standards.
 - l. Compliance with recognized testing agency standards.
 - m. Application of testing agency labels and seals.
 - n. Notation of coordination requirements.
- C. Samples:
1. Following Contractor's review and approval, submit to the Architect three (3) individual Samples of each material in sizes as required by the Specifications and as practical.
 2. Submittals required other than for selection of color, texture, fabric or finish shall be given to the Architect at a time determined by the Contractor, which will allow for resubmittal and which will not cause any delay in the Work.
 3. Corrected samples shall be resubmitted for approval as per the original submittal.
 4. Color Selection: Within 30 days of the date after release of the Drawings and Specifications for a specific portion of the Project, submit to the Architect for approval, samples and appropriate information required for the selection of colors, textures, fabric and finishes. Samples shall be in pairs and representative or the full range of color, veining, texture and so forth of a material. Final selection of color, textures, fabrics or finishes will not be made until all applicable and related submittals have been provided. If the Contractor fails to provide the required samples and related information within the time period, the Architect shall have the option of selecting colors, textures, fabric, finishes or specific materials from those specified or approved and the Contractor shall be obligated to provide the material selected by the Architect. Selections approved for one portion of the Project shall apply to subsequently issued portions of the Project unless the Architect specifically designates otherwise.
- D. Submit Shop Drawings and Samples for only those items specifically required in the Specifications. Contractor shall be responsible for obtaining Shop Drawings required for the progress of the Work, even though such Shop Drawings may not require the Architect's review.

1.04 QUALITY CONTROL SUBMITTALS

- A. Submit Quality Control Submittals, including design data, certifications, manufacturer's instructions, manufacturer's field reports, and other quality control submittals as required by individual Sections of the Specifications.

- B. Certifications: Where individual Sections of the Specifications require certification that a product, material, or installation complies with specified requirements, submit a notarized certification from the manufacturer certifying compliance with specified requirements.
 - 1. Signature: Certification shall be signed by an officer of the manufacturer or other individual authorized to sign documents on behalf of the company.
- C. Equipment Lists: Following Contractor's review and approval, submit to the Architect a complete list of major items of architectural, mechanical, plumbing and electrical equipment and materials, within 30 calendar days after release of the Drawings and Specifications for a specific portion of the Project. Submit all items at one time for each portion or Phase of the Project. Partial list will not be acceptable.
 - 1. Submittals shall include the Manufacturer's Specifications, weights, space requirements, physical dimensions, rating of equipment and supplemental information requested by the Architect.
 - 2. Submit performance curves for pumps and fans and other equipment as required in the Technical Sections. Where a submittal sheet describes items in addition to that item being submitted, delete such items.
 - 3. Clearly note equipment and materials which deviate from those shown or specified in size, weight, required clearances, and location of access.
 - 4. Modifications to the Work as shown or specified in submittals shall be indicated and shall be provided by the Contractor as a part of the Work.
- D. Manufacturer's Instructions: Where Specifications require Work to be furnished, installed or performed in accordance with a specified product manufacturer's printed instructions, distribute copies of such instructions to concerned parties.
- E. Inspection and Test Reports: Requirements for submittal of inspection and test reports from independent testing agencies are specified in Section 01 45 00 – Quality Control.

1.05 CUSTOM AND UNIQUE TOOLS, EQUIPMENT, AND SOFTWARE

- A. Custom and Unique Tools and Equipment: Identify and label all custom or unique tools, equipment, specialty items, or other items specifically created for the Project, or for use on the Project, including, but not limited to the following:
 - 1. Custom cutters and knives, minimum 2 of each type.
 - 2. Custom casting dies or molds.
 - 3. Custom fixtures or templates.
 - 4. Custom silkscreen plates.
 - 5. Custom forms or formwork.
 - 6. Custom finish formulas or mixes.
 - 7. Special fasteners and their installation tools, minimum of 2 dozen fasteners of each type and minimum of 2 tools of each type.
 - 8. Custom tools or machinery parts, minimum of 2 tools of each type and 1 of each machinery part of each type.
- B. Inventory and list all custom and unique tools and equipment and submit to Architect and Owner on a monthly basis. Include the following for each item:
 - 1. Identity and label of the item.
 - 2. Physical location and disposition.
 - 3. Actual cost.
 - 4. Actual replacement Insurance Certificate(s) for each item to replace the item should it be destroyed, lost or stolen, either accidentally or purposefully.
 - 5. Other appropriate information as necessary to identify the item and its use.

- C. Software and Programs: Identify and list all proprietary and custom programs and software and submit to Architect and Owner at the completion of the Project. Include the following:
 - 1. Program/Software name and associated equipment or component where used.
 - 2. Program user guides and instruction manuals.
 - 3. Access codes, and/or passwords.
 - 4. Authenticity certificates (if any).
 - 5. All other items as may be necessary to allow Owner's use and future use in construction of future Project Phases.
 - 6. Written proof that any applicable fees and/or royalties have been paid.
- D. Maintain, preserve and properly store custom and unique tools, equipment and software, properly labeled and inventoried, and deliver to Owner, with copy of transmittal to Architect, at completion of Project after final training and demonstration as specified.
 - 1. As an alternative to delivery of items to the Owner at completion of Project, the Owner, at its sole discretion, may direct the Contractor to destroy, sell or otherwise dispose of the custom or unique tools, equipment and software items.

1.06 SUBMITTALS SCHEDULE

- A. After development and acceptance of the Contractor's Construction Schedule, prepare a complete schedule of submittals. Submit the Submittal Schedule within 15 calendar days of the acceptance of the Contractor's Construction Schedule.
 - 1. Coordinate Submittal Schedule with the list of subcontracts, Schedule of Values, and the list of products as well as the Contractor's Construction Schedule.
 - 2. Prepare the schedule in chronological order. Provide the following information:
 - a. Scheduled date for the first submittal.
 - b. Related Section number.
 - c. Submittal category (Shop Drawings, Product Data, or Samples).
 - d. Name of the subcontractor.
 - e. Description of the part of the Work covered.
- B. Distribution: Following approval of a submittal, distribute copies to the Owner's representative, subcontractors, and other parties required to comply with submittal dates indicated.
- C. Schedule Updating: Revise the Submittal Schedule after each meeting or activity where revisions have been recognized or made. Issue the updated Submittal Schedule concurrently with the report of each meeting.

1.07 REVIEW PROCESS

- A. Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
 - 1. Compliance with specified characteristics is the Contractor's responsibility.
- B. Architect will review each submittal, make marks to indicate action taken, and return promptly.
- C. Unsolicited Submittals: The Architect will return unsolicited submittals to the sender without action. Architect may choose to transmit notice to the sender that unsolicited submittals received will be discarded.

- D. If the corrections identified on a Submittal are not made and the review of the same Submittal exceeds two (2) reviews, the Contractor will be billed for additional reviews at the current hourly rate charged by the Architect or his Consultants. The Architect will charge the Owner, and such costs will be deducted from monies still due the Contractor.
- E. Action Stamp: The Architect will stamp each submittal with a uniform, action stamp. The Architect will mark the stamp appropriately to indicated the action taken, as follows:
1. When the Architect marks a submittal "Approved As Noted," the work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and the requirements of the Contract Documents.
 2. When the Architect marks a submittal "Revise and Resubmit," do not proceed with work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal according to the notations; resubmit without delay. Repeat as necessary to obtain appropriate action mark.
 3. When the Architect marks a submittal "Rejected, Do Not Resubmit," do not resubmit, select a new product or system that meets the drawn and specified requirements and resubmit without delay. Repeat as necessary to obtain appropriate action mark.
 4. Do not resubmit an "Approved as Noted" Submittal.
 5. Where a submittal is for information or record purposes or special processing or other activity, the Architect will not review or take action.

END OF SECTION

SECTION 01 42 00

REFERENCES

1.01 QUALITY ASSURANCE

- A. For products or workmanship specified by association, trade, or Federal Standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes. Such Reference Standards are made part of the Contract Documents by reference.
- B. Conform to reference standard by date of issue current on date of Contract Documents.
- C. Obtain copies of standards when required by Contract Documents.
- D. Should specified reference standards conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.
- E. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.02 SCHEDULE OF REFERENCES

- A. The following is a partial list of agencies, councils, institutions, associations, and so forth that may be referred to in the Contract Documents. This list is not to be interpreted as being complete.

AA	Aluminum Association	www.aluminum.org
AABC	Associated Air Balance Council	www.aabchq.com
AAMA	American Architectural Manufacturers Association	www.aamanet.org
AASHTO	American Association of State Highway	www.aashto.org
ACI	American Concrete Institute	www.aci-int.org
ADC	Air Diffusion Council	www.flexibleduct.org
AFPA	American Forest and Paper Association	www.afandpa.org
AI	Asphalt Institute	www.asphaltinstitute.org
AIA	American Institute of Architects	www.aia.org
AISC	American Institute of Steel Construction	www.aisc.org
ISI	American Iron and Steel Institute	www.steel.org
AITC	American Institute of Timber Construction	www.aitc-glulam.org
AMCA	Air Movement and Control Association	www.amca.org
AMG	Arizona Masonry Guild	www.masonryforlife.com
ANSI	American National Standards Institute	www.ansi.org

APA	Engineered Wood Association	www.apawood.org
API	American Petroleum Institute	www.api.org
ARI	Air-Conditioning and Refrigeration Institute	www.ari.org
ASHRAE	American Society of Heating, Refrigerating	www.ashrae.org
ASME	American Society of Mechanical Engineers	www.asme.org
ASTM	American Society for Testing and Materials	www.astm.org
AWI	Architectural Woodwork Institute	www.awinet.org
AWPA	American Wood Preservers Association	www.awpa.com
AWS	American Welding Society	www.aws.org
AWWA	American Water Works Association	www.awwa.org
BHMA	Builders Hardware Manufacturer's Association	www.buildershardware.com
BIA	Brick Industry Association	www.brickinfo.org
CDA	Copper Development Association	www.copper.org
CISCA	Ceilings and Interior Systems Construction Association	www.cisca.org
CLFMI	Chain Link Fence Manufacturers Institute	www.chainlinkinfo.org
CRI	The Carpet and Rug Institute	www.carpet-rug.com
CRSI	Concrete Reinforcing Steel Institute	www.crsi.org
CSSB	Cedar Shingle and Shake Bureau	www.cedarbureau.org
DHI	Door and Hardware Institute	www.dhi.org
EJMA	Expansion Joint Manufacturers Association	www.ejma.org
FMG	FM Global	www.allendale.com
GA	Gypsum Association	www.gypsum.org
GANA	Glass Association of North America	www.glasswebsite.com
ICC	International Code Council	http://www.iccsafe.org/
IEEE	Institute of Electrical and Electronics Engineers	www.ieee.org
IGMA	Insulating Glass Manufacturers Alliance	www.igmaonline.org
MAG	Maricopa Association of Governments	www.mag.maricopa.gov
MBMA	Metal Building Manufacturer's Association	www.mbma.com

MIL	Military Specification	http://dodssp.daps.dla.mil/
ML/SFA	Metal Lath/Steel Framing Association	www.naamm.org
NAAMM	National Association of Architectural	www.naamm.org
NCMA	National Concrete Masonry Association	www.ncma.org
NEBB	National Environmental Balancing Bureau	www.nebb.org
NEMA	National Electrical Manufacturers Association	www.nema.org
NFPA	National Fire Protection Association	www.nfpa.org
NRCA	National Roofing Contractors Association	www.nrca.net
NTMA	National Terrazzo and Mosaic Association	www.ntma.com
PCA	Portland Cement Association	www.cement.org
PCI	Precast/Prestressed Concrete Institute	www.pci.org
PDCA	Painting and Decorating Contractors of America	www.pdca.com
PS	Product Standard U. S. Department of Commerce	http://ts.nist.gov/Standards/Conformity/sccg.cfm
RIS	Redwood Inspection Service	www.redwoodinspection.com
RFCI	Resilient Floor Covering Institute	www.rfci.com
SDI	Steel Deck Institute	www.sdi.org
SDI	Steel Door Institute	www.steeldoor.org
SIGMA	Sealed Insulating Glass Manufacturers Association	Refer to IGMA
SJI	Steel Joist Institute	www.steeljoist.org
SMACNA	Sheet Metal and Air Conditioning	www.smacna.org
SSPC	The Society for Protective Coatings	www.sspc.org
TCA	Tile Council of America, Inc.	www.tileusa.com
UL	Underwriters' Laboratories, Inc.	www.ul.com
WCLIB	West Coast Lumber Inspection Bureau	www.wclib.org
WDMA	Window and Door Manufacturing Association	www.wdma.com
WWPA	Western Wood Products Association	www.wwpa.org

END OF SECTION

SECTION 01 45 00

QUALITY CONTROL

PART 1 GENERAL

1.01 TESTING LABORATORY SERVICES

- A. Contractor shall include an allowance of thirty thousand (30,000.00) dollars to retain and pay for 1). The services of an Independent Certified Testing Laboratory to perform the Work called for in the Contract Documents, 2). Have Structural Engineer provide special structural inspections, 3). Have Structural Engineer provide structural clarifications.
- B. Contractor shall retain an Independent Certified Testing Laboratory, acceptable to Owner, to perform tests and inspections where specifically indicated to be provided and paid for by the Contractor.
- C. Contractor shall cooperate with Testing Laboratory personnel and provide access to the Work as required to perform testing or inspections called for in the Construction Documents.
- D. Contractor shall furnish samples for such tests and deliver them to the Testing Laboratory in quantities as required by the Contract Documents.
- E. Contractor shall provide Testing Laboratory 24 hours minimum notice in advance of Work being performed that requires testing and/or inspection services.
- F. The Testing Laboratory(s) shall, within 24 hours of performing a test or inspection, distribute digital copies of reports as follows:
 - 1. Owner's Representative.
 - 2. Contractor
 - 3. Architect
 - 4. Engineering Consultant
- G. All costs for additional inspections and/or retesting required when initial testing indicates Work does not comply with Contract Documents, shall be paid for by the Contractor.
- H. Refer to individual specification Sections and General Notes on Drawings for specific requirements for Testing and/or Inspections. The following lists are intended as a guide to the Contractor to aid in determining testing requirements for the Project, however, the requirements specified in the Technical Sections shall take precedence over these lists and these lists are not to be interpreted as being complete.
 - 1. Special Inspections and Testing:
 - a. 03 30 00 - Cast-In-Place Concrete: Test cylinders, slump test(s)
 - b. 04 05 15 - Mortar and Masonry Grout: Test of grout mix
 - c. 04 22 00 - Concrete Unit Masonry: Prism testing
 - d. 05 10 00 - Structural Steel Framing: Welded connection tests, inspection of high strength bolts.
 - e. 05 31 00 - Steel Deck: Deck testing/inspection when required.
 - f. 07 24 00 - Exterior Insulation and Finish System: Installation
 - g. 31 01 00 - Earthwork: Test imported fill materials if required, observation of earthwork by Geotechnical Engineer, density and moisture testing of trench backfill, field density tests of underslab fill and backfill.
 - h. 31 31 00 – Soil Treatment: Field test termite treatment.

2. Quality Control Testing and Inspections:
 - a. 03 30 00 - Cast-In-Place Concrete: Floor flatness, calcium chloride moisture testing.
 - b. 05 41 00 – Cold-Formed Steel Framing: Steel framing properties, when required.
 - c. 07 92 00 – Joint Sealers: Field adhesion testing and stain testing.
 - d. Division 9 Flooring Sections: Moisture content of concrete sub-floors.
 - e. 32 12 16 - Asphaltic Concrete Paving: Smoothness tests

1.02 CONTRACTOR'S QUALITY CONTROL

- A. Where the Contract Documents require that a particular product be installed and/or applied by an applicator approved by the Manufacturer, it is the Contractor's responsibility to ensure that the subcontractor employed for such work is approved in writing by the Manufacturer of the product. Such subcontractor(s) shall provide evidence of being approved to the Owner and Architect prior to being awarded the Subcontract for the Work.
- B. Work shall be executed by persons skilled in the work required. Conform to the highest standards of the Trade or Trades involved.

END OF SECTION

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 GENERAL

- A. Comply with codes and regulations regarding potable drinking water, sanitation, dust control, fire protection, and other temporary controls.
- B. Remove temporary office facilities, toilets, storage sheds and other construction of temporary nature from the site as soon as, in the opinion of the Architect, the progress of the work will permit. Recondition and restore to a condition acceptable to the Architect, areas of the site occupied by temporary facilities.
- C. Obtain written approval from the Owner a minimum of 72 hours prior to disconnection or shutting off service or utility.

1.02 TEMPORARY ELECTRICITY

- A. Connect to existing electric service locations at existing building(s) as necessary. Power consumption shall not disrupt ongoing electrical power service needs of existing buildings and facilities during length of construction. Where necessary to provide adequate electrical service for construction, provide and pay for electrical service from Utility and make arrangements for such service.
- B. Provide temporary electric feeder from existing building(s) electrical service locations as directed or as indicated on Drawings.
- C. Provide power outlets for construction operations, with branch wiring and distribution boxes. Provide flexible power cords as necessary.

1.03 TEMPORARY LIGHTING

- A. Provide lighting for construction operations to achieve a minimum lighting level of 2 watts/sq. ft. Contractor may utilize existing lighting where available.
- B. Provide adequate floodlights, clusters and spot illumination to work areas after dark.
- C. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.
- D. Maintain lighting and provide routine repairs.
- E. Replace all lamps used during the construction period immediately prior to issuance of Certificate of Substantial Completion.

1.04 TEMPORARY HEATING/COOLING AND VENTILATING

- A. Provide and pay for heating/cooling devices and heat as required to maintain appropriate and specified conditions for construction operations. Utilize existing mechanical systems where available. Owner will pay cost of energy used. Exercise measures to conserve energy.

- B. Prior to operation of permanent equipment for temporary heating or cooling purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.
 - 1. All ducts shall be vacuumed and all filters shall be replaced immediately prior to issuance of Certificate of Substantial Completion.
- C. Maintain minimum/maximum ambient temperature and humidity conditions required by individual specification sections for installation of materials and finishes required to have specific environmental conditions.
- D. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases. Utilize existing ventilation equipment where available. Extend and supplement equipment with temporary fan units as required to maintain clean air for construction operations.
- E. At end of construction, return existing heating and ventilating equipment to same or better condition than originally found.

1.05 COMMUNICATIONS

- A. At time of Project mobilization, or before, provide Architect and Owner with Project team directory, including the following:
 - 1. General Contractor's home office.
 - 2. Contractor's superintendant mobile telephone number.
 - 3. Other major subcontractors and Project Team members.
- B. Provide superintendant with mobile telephone throughout construction period.

1.06 TEMPORARY WATER SERVICE

- A. Provide, maintain and pay for suitable quality water service required for continued operations.
- B. Extend branch piping throughout the site to provide outlets for hoses with threaded connections.

1.07 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Existing facilities in existing buildings are not available for use unless specifically authorized by Owner.
 - 1. Where authorized by Owner, existing facilities used during construction operations shall be cleaned and returned at same or better condition than originally found.

1.08 TEMPORARY FIRE PROTECTION

- A. Provide adequate number of fire extinguishers to protect the Work.
- B. Comply with fire insurance and governing regulations.
- C. Provide UL labeled ABC all-purpose fire extinguishers adequate in size and number.
- D. Provide temporary office and storage areas with fire extinguishers.

1.09 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations.
- B. Provide protection for plant life designated to remain. Replace damaged plant life.
- C. Protect vehicles, stored materials, site and structures from damage.

1.10 FENCING

- A. Construction: Commercial grade chain link fence.
- B. Provide 6'-0" high fence around construction site, staging areas, landscape and retention areas as necessary to protect Work as indicated on Construction Access Plan on Drawings; equip with vehicular and pedestrian gates with locks.
- C. Locate gates for access to work areas, as required. Close and lock after working hours.

1.11 ENVIRONMENT PROTECTION AND CONTROLS

- A. Exercise controls to keep noise and dust during construction to a minimum. Traffic or construction areas shall be sprinkled with water or chemicals as required and in accordance with applicable regulatory requirements.
- B. Environmental Protection: Conduct construction operations and operate equipment and machinery using methods complying with environmental regulations to avoid or minimize pollution or contamination to air, water, waterways, soil, groundwater, or other natural resources.
 - 1. Air Resources: Prevent creation of dust, air pollution, and odors.
 - 2. Store volatile liquids, including fuels and solvents, in closed containers.
 - 3. Properly maintain equipment to reduce gaseous pollutant emissions.
 - 4. Properly dispose of hazardous or contaminated debris in compliance with environmental regulations.
 - 5. Grade site to drain. Maintain excavations free of water. Provide, operate and maintain pumping equipment as may be necessary.
 - 6. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
 - 7. Comply with local requirements for storm water pollution prevention.

1.12 EXTERIOR ENCLOSURES

- A. Provide temporary weather-tight closure of exterior openings to accommodate acceptable working conditions and protection for products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification Sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.13 PROTECTION OF INSTALLED WORK

- A. Protect all installed work. Provide the special protection features where specified in individual specification Sections.
- B. Provide temporary and removable protection for installed products. Control activity in immediate work area to avoid damage.

- C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with plywood sheets and waterproof covering.
- E. Prohibit traffic or storage directly on waterproofed or roofed surfaces. If traffic or activity is necessary, provide protection in accordance with material and or system manufacturer's printed instructions.
- F. Prohibit traffic from landscaped areas.

1.14 SECURITY

- A. Coordinate with Owner's existing security services to protect Work and existing facilities, and Owner's operations from unauthorized entry, vandalism or theft.

1.15 SITE ACCESS, PARKING AND STAGING

- A. Coordinate site access and parking to accommodate construction personnel with Owner. Restrict site access and parking to areas as indicated on Construction Access Plan on Drawings, and by Owner.
- B. Comply with Contractor Use of Site requirements of Section 01 11 00 – Summary of Work.
- C. Maintain access to fire hydrants, free of obstructions.
- D. Provide fenced area with secure locking gates as required for construction staging throughout the construction period at location designated on Drawings.
- E. Provide means of removing mud from vehicle wheels before entering streets.

1.16 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition on a daily basis.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Regularly remove waste materials, debris, and rubbish from site and dispose off-site. Do not allow to accumulate.

1.17 PROJECT IDENTIFICATION

- A. General Contractor is limited to one (1) sign located on their construction trailer. Additional signage must be approved by Owner's Representative. Subcontractors, suppliers, manufacturers, consultants, etc., shall not furnish company information banners unless approved by Owner's Representative.
- B. No other signs are allowed without Owner's permission except those required by law. Subcontractor signs are not permitted.

1.18 FIELD OFFICES AND SHEDS

- A. Office: Weather-tight, with lighting, electrical outlets, heating, cooling and ventilating equipment, and equipped with sturdy furniture, drawing rack and drawing display tables and shelves.
- B. Locate offices and sheds as approved by Owner.

END OF SECTION

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 DELIVERY, STORAGE AND HANDLING

- A. Deliver manufactured materials in original packages, containers or bundles, with the seals unbroken, identified by the name and mark of the Manufacturer, the product name, color, number, and so forth.
- B. Deliver fabrications in as large assemblies as practicable. Fabrications specified to be shop-primed or shop-finished shall be packaged or crated as required to preserve such priming or finish intact and free from damage.
- C. The Contractor shall be responsible for protecting all materials and equipment furnished under the Contract including materials and equipment furnished by the Owner for the Contractor to install and for the materials and equipment furnished and installed by the Owner's separate contractors in the completed or partially completed Work.
- D. Store materials in a manner to properly protect them from damage. Materials or equipment damaged by handling, weather, dirt or other cause will not be acceptable and are to be removed from the site. Replace such materials immediately so as not to delay the Work.
- E. Store materials so as to cause no obstructions. Store off sidewalks, roadways, and underground services.
- F. When a room in the Project is used as a shop or store room, the Contractor shall be responsible for all repairs, patching or cleaning necessary due to such use. Location of such storage space shall be subject to approval of the Owner.

1.02 SUBSTITUTIONS AND PRODUCT OPTIONS

- A. Whenever a product is specified by using a proprietary name or the name of a particular Manufacturer or Vendor, the specific item mentioned shall be understood as establishing type, function, dimension, appearance, and quality desired.
- B. Where not specified to be proprietary, or a ERAU required product, other manufacturers' products may be accepted provided sufficient information is submitted to allow the Architect to determine that products proposed are equivalent to those named.
- C. Prior Approvals:
 - 1. Substitutions will be considered when written request has been submitted to the Architect for approval.
 - 2. Contractor shall request approval of such substitution, in writing, to the Architect using Document 00 43 25 – Substitution Request (During the Bidding Phase) form contained in the Project Manual.
 - 3. Each such request shall include all information requested below for Requests for approval after award of a Contract. If the Owner approves any proposed substitution, such approval shall be set forth in an Addendum.

- D. Requests for Approval After Award of a Contract:
1. Requests shall be made only under one of the following conditions:
 - a. Specified product or material is not available.
 - b. Extensive revisions to the Contract Documents are not required.
 - c. Proposed changes are consistent with intent of the Contract Documents.
 - d. Request is timely and properly submitted.
 - e. Specified product or material cannot be provided within the Contract Time.
 - f. Request relates to an “or equal” clause.
 - g. Proposed substitution offers Owner a substantial advantage in cost, time, or other considerations.
 - h. Specified product or material cannot receive regulatory approval.
 - i. Specified product or material is incompatible with other materials.
 - j. Specified product or material cannot be coordinated with other materials.
 - k. Specified product or material manufacturer cannot provide the specified warranty.
 2. Requests shall be submitted to the Architect a minimum of 28 days prior to date Contractor is required to place an order for the product.
 3. Contractor shall request approval of such substitution, in writing, to the Architect in accordance with Bidding and Contract Requirements, using Section 00 63 25 – Substitution Request (After the Bidding Phase) form contained in the Project Manual.
 4. The request shall specifically state the reason that the product is unavailable with evidence to substantiate the reason.
 5. Requests made directly to Architect by suppliers, subcontractors and distributors that are not from the Contractor will not be accepted by the Architect or Owner.
 6. Architect and Owner’s Representative will approve or reject substitution in writing.
 7. Substitutions will not be considered if they are indicated or implied on Shop Drawings.
- D. Contractor shall submit descriptive brochures, drawings, samples and other data as is necessary to provide direct comparison to the specified materials after reviewing and determining that product meets specified requirements. Submittals shall be well marked and identified as to types and kind of the items being submitted for approval. Lack of sufficient information will be cause for rejection. Reference to catalogs will not be acceptable unless catalog is submitted with approval request and the specific product or material and its components are clearly identified.
- E. In submitting a substitution, the Contractor makes the following representations:
1. Proposed substitution has been fully investigated and determined to be equal or superior to specified product or material.
 2. The same warranty will be furnished for proposed substitution as for specified product or material.
 3. The same maintenance service and source of replacement parts, as applicable, is available.
 4. Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
 5. Cost data included on the substitution request is complete. Claims for additional costs related to accepted substitution and its impact on other portions of the Work which may subsequently become apparent are waived.
 6. Proposed substitution does not affect dimensions and functional clearances.

7. Payment for costs for additional services of Architect caused by the substitution shall be paid by Contractor. The Contractor will be billed for additional services at the current hourly rate charged by the Architect. The Architect will charge the Owner, and such costs will be deducted from monies still due the Contractor.
8. Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

END OF SECTION

SECTION 01 73 00

EXECUTION REQUIREMENTS

PART 1 GENERAL

1.01 EXAMINATION AND COORDINATION OF WORK

- A. Verification of Conditions: Examine and verify surfaces, subsurfaces, condition and serviceability of previous work to receive subsequent work and report detrimental conditions in writing to the Architect.
- B. Commencement of work acknowledges acceptance and serviceability of previous work.
- C. Coordination: Coordinate with other work which affects, connects with, or will be concealed by subsequent work.
 - 1. Work within concealed ceiling and plenum spaces shall be coordinated with all other work within these spaces to assure a coordinated assembly.
 - 2. Coordinate location and layout of mechanical, electrical and other systems located within suspended ceilings.
 - 3. Utilize CAD or Revit Model to create fully coordinated model and Shop Drawings of Project infrastructure. Perform clash detection analysis and report conflicts to Architect.
 - 4. Notify Architect immediately if conflicts are found.
 - 5. Adjust work in place in concealed ceiling spaces as required to allow installation of other work which cannot be adjusted.
- D. Any remedial work required to be performed on previously placed work after new work has commenced shall be by and at the expense of the Contractor and/or sub-contractor having commenced the new work.

1.02 TOLERANCES

- A. Certain tolerances are listed in the various specification sections and on the Drawings. In addition, other tolerance limits are set forth below. These tolerances are the maximum variation allowed on the Project.
- B. Each of the Contractors shall review the tolerance limits established for their work as they relate to the other work on the Project. Should the tolerance limits established for their work be in conflict with those limits established for other adjoining work, the Architect and Owner shall be notified before proceeding.
- C. It is the intention of the Contract Documents that, assuming work in place is within the tolerance limits established, or has been accepted by following contractor(s), subsequent work shall be adjusted as required.
- D. Tolerances:
 - 1. Concrete: 1/8 inch plus or minus in any 10 feet and 3/4 inch total overall in any direction.
 - 2. Masonry: 1/8 inch plus or minus in any 10 feet and 1/4 inch total overall in any direction.
 - 3. Structural Steel: 1/8 inch plus or minus in 60 feet and 1/2 inch total overall in any direction.
 - 4. Miscellaneous Metal: 1/8 inch plus or minus in 20 feet and 1/4 inch total overall in any direction.

5. Ornamental Metal: 1/8 inch total overall in any direction.
 6. Drywall: 1/16 inch plus or minus in any 12 feet and 1/8 inch total overall in any direction.
 7. Acoustic Tile: 1/8 inch maximum variation overall in any direction.
 8. Granite and Marble: 1/16 inch maximum variation overall in any direction.
 9. Millwork: 1/16 inch Maximum overall in any direction.
 10. Ceramic Tile: 1/16 inch maximum overall in any direction.
- E. All materials such as Stone tile and veneers, acoustic tile, lay-in acoustical panel and decorative ceilings, ceramic tile, VCT, wood flooring, and so forth, are to meet flush with adjacent pieces of the same material.

1.03 APPROVED APPLICATORS

- A. Where specific instructions in the Specifications require that a particular product and/or material be applied and/or installed by an "approved applicator" it shall be the Contractor's responsibility to insure that any subcontractor or sub-subcontractor used for such Work is in fact currently certified by the particular Manufacturer for this type of installation or application.

1.04 APPROVED MANUFACTURERS

- A. Each Section includes a list of Manufacturers whose equipment is acceptable as to manufacture, subject to conformance with the Contract Documents. Careful checking must be completed by the Contractor and the manufacturer or equipment supplier to verify that the equipment will meet all capacities, requirements, space allocations and is suitable for the intended purpose specified.

1.05 REFERENCE DATA

- A. Reference data made available to the Contractor is for the Contractor's information only, and neither the Owner nor the Architect assume any responsibility for the Contractor's conclusions.
- B. The Contractor shall establish and maintain all building and construction grades, lines, levels, and bench marks. This Work shall be performed by a licensed Civil Engineer or Surveyor under the employ of the Contractor, who shall certify to the Owner that he has performed this service.
- C. The Contractor shall not remove any fixed property line markers, monuments or data.

END OF SECTION

SECTION 01 73 29

CUTTING AND PATCHING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Cutting, fitting and patching, including attendant excavation and backfill required to complete Work, and for:
 - 1. Making several parts fit together properly.
 - 2. Uncovering portions of Work to provide for installation of ill-timed Work.
 - 3. Removing and replacing defective and non-conforming Work.
 - 4. Removing samples of installed Work required for testing, as directed by Architect.
 - 5. Providing routine penetrations of non-structural surfaces for installation of piping and electrical conduit.
 - 6. Attaching new materials to existing remodeled areas.

1.02 SUBMITTALS

- A. In advance of executing any cutting or alterations, submit written request to Architect requesting consent to proceed with cutting which affects:
 - 1. Work of Owner or other trades.
 - 2. Structural value or integrity of any element of Project.
 - 3. Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.
 - 4. Efficiency, operational life, maintenance or safety of operational elements.
 - 5. Visual qualities of sight-exposed elements.
- B. Include in request:
 - 1. Identification of Project.
 - 2. Description of affected Work.
 - 3. Necessity for cutting, alteration or excavation.
 - 4. Effect of Work of Owner or other trades, or structural or weatherproof integrity of Project.
 - 5. Description of proposed Work:
 - a. Scope of cutting, patching, alteration, or excavation.
 - b. Trades which will execute Work.
 - c. Products proposed to be used.
 - d. Extent of refinishing to be done.
 - 6. Alternatives to cutting and patching.
 - 7. Cost proposal, when applicable.
 - 8. Written permission of trades who's Work will be affected.
- C. Submit written notice to Architect designating time Work will be uncovered to provide for observation.

1.03 PAYMENT FOR COSTS

- A. Cost caused by ill-timed or defective Work or Work not conforming to Contract Documents, including costs for additional services of Architect and Engineer to be paid by Contractor.

- B. Cost of Work done on written instructions of Architect, other than defective or nonconforming Work, will be paid by Owner on approval of written Change Order. Provide written cost proposals prior to proceeding with cutting and patching proposed by Architect.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Provide for replacement of Work removed. Comply with Contract Documents for type of Work standards and Specification requirements for each specific product involved.

PART 3 EXECUTION

3.01 INSPECTION

- A. Inspect existing conditions of Work, including elements subject to movement or damage during cutting and patching, and excavating and backfilling. After uncovering Work, inspect conditions affecting installation of new products and verify procedures with Architect.
- B. Report unsatisfactory or questionable conditions in writing to Architect/Engineer. Do not proceed with Work until further instructions are received.

3.02 PREPARATION

- A. Provide shoring, bracing and supports as required to maintain structural integrity of Work.
- B. Provide devices and methods to protect other portions of Work from damage, including elements which may be exposed by cutting and patching Work. Maintain excavations free from water.

3.03 ERECTION, INSTALLATION AND APPLICATION

- A. Performance:
 - 1. Execute fitting and adjustment of products to provide finished installation to comply with and match specified tolerances and finishes.
 - 2. Execute cutting and demolition by methods which prevent damage to other Work to provide proper surfaces to receive installation of repairs and new Work.
 - 3. Execute excavating and backfilling by methods which prevent damage to other Work and settlement as specified in Section 31 01 00.
- B. Employ original installer or fabricator to perform cutting and patching for:
 - 1. Weather-exposed surfaces and moisture-resistant elements such as roofing, sheet metal, sealants and waterproofing.
 - 2. Sight-exposed finished surfaces.
- C. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances and finishes as shown on Drawings and as specified.
- D. Fit Work airtight to pipes, sleeves, ducts, conduit and other penetrations through surfaces. Conform to fire code requirements for penetrations and maintain integrity of fire walls and ceilings.

- E. Restore Work which has been cut or removed. Install new products to provide completed Work in accordance with requirements of Contract Documents and as required to match surrounding areas and surfaces.
- F. Refinish entire surfaces as necessary to provide an even, matching finish as follows:
 - 1. Painted Walls or Ceilings: To nearest intersection with another finish or corner.
 - 2. Where Applied Finishes Occur (i.e wallcovering, tile, wood paneling): To nearest intersection of finish without damage to adjacent material. Where match of pattern, grain, texture, or similar finish cannot be made, refinish area to intersection with other finish or corner.
 - 3. Manufactured or Shop Fabricated Materials: Replace entire affected surface or material.

END OF SECTION

SECTION 01 77 00

CONTRACT CLOSEOUT

PART 1 GENERAL

1.01 FINAL CLEANING

- A. In addition to cleaning specified in individual specification sections, perform special cleaning at completion of the Work, including, but not limited to, the following items. Employ experienced workmen or professional cleaners for the final cleaning:
 - 1. Remove marks, stains, fingerprints, soil and dirt from paint, stain and wall covering.
 - 2. Remove spots, soil, paint and mastic from tile work and wash same.
 - 3. Clean fixtures, equipment and piping; remove stains, paint, dirt and dust.
 - 4. Remove temporary floor protections; clean and polish floors.
 - 5. Clean concrete walks and slabs of plaster or cement droppings, paint and other objectionable materials.
 - 6. Clean exterior and interior metal surfaces, including doors and windows and their frames.
 - 7. Remove oil, stains, dust, dirt, paint and the like from items required to have a polished finish; polish and leave without fingermarks or other blemishes.
 - 8. Wash windows inside and outside.
 - 9. Polish mirrors.
- B. Make building(s) ready for occupancy in every respect. Lay heavy building paper in main circulation areas to protect the floors, including Owner provided products and materials, until final inspection and acceptance.
- C. Existing improvements, inside or outside the property which are disturbed, damaged or destroyed by the Work under the Contract shall be restored to their original condition unless as part of the Work, improvements were required.

1.02 PROJECT RECORD DOCUMENTS

- A. As the Work progresses, the Contractor shall maintain a complete and accurate record of changes or deviations from the Contract Documents and Submittals, indicating the Work as actually installed. Document information by daily corrections and/or additions in the appropriate locations on a record set of prints of the Construction Drawings and Submittals and a copy of the Specifications which shall be maintained by the Contractor solely for the purpose of this documentation. Keep this record set of Construction Documents and Submittals at the Project site for review by the Owner and Architect.
- B. Information contained in the Record Documents shall include, but not be limited to:
 - 1. Modifications made by Addenda, Bulletins, Change Orders, Construction Change Directives and Architect's Supplemental Instructions.
 - 2. Location of site underground pipes, conduits, ducts, cables and similar work, dimensioned horizontally to permanent points of reference and located vertically by indicating depth of burial and invert elevations. Dimensions shall be accurate within 2 inches.

3. Location of building plumbing piping, sprinkler piping, control valves, shut-off valves, heating and air conditioning equipment, mechanical piping, ductwork, major conduit runs, power, control and alarm wiring, etc., dimensioned horizontally to permanent points of reference. Dimensions shall be accurate within 2 inches. By notation, describe the vertical location of the item such as "below slab," "above ceiling," etc.
 4. Modifications made to accommodate field conditions.
 5. Location and function of mechanical and electrical control devices and shut-off valves.
 6. Panel schedules showing final circuiting of electrical fixtures and equipment.
- C. Not more than weekly, the information on the hard copy of the Construction Drawings and Submittals, the Contractor shall electronically transfer to the digital Revit files the Architect will have furnished to the Contractor for the purpose of maintaining the Record Drawings (as-built conditions).
1. The digital Revit files the Contractor uses for Record Drawings shall include, but not be limited to, the piping, conduit, duct layout and routing files prepared by the Contractor and/or its Subcontractors from the digital Revit files obtained from the Architect for the purpose of preparing their detailed submittals prior to starting construction and as approved by the Architect and/or its Consultants.
 2. The Revit files shall be prepared using the *line weights* and *work sets* as established by the Architect.
 3. The Contractor will maintain the Record Drawings in a separate Revit Model as a subset of the model provided by the Architect and/or the Consultants.
- D. Upon Substantial Completion of the Work, deliver the complete set of hard copy prints, one set of annotated Submittals and an annotated Specifications set to the Architect for review and comment.
1. The Architect will transfer the approved record Drawing hard copy prints and Specification information into the Project Documents to be delivered to the Owner by the Architect.

1.03 OWNERS MANUAL

- A. Owner's Manual: Prior to final payment, provide 1 digital copy and three (3) hard-back, loose-leaf binders, suitably typed, indexed and labeled, containing the following:
1. Subcontractors and major suppliers list with companies names, addresses, email addresses and telephone numbers.
 2. Warranties and certifications.
 3. Affidavit from general and subcontractors on use of asbestos free materials.
 4. Maintenance/operation instructions.
 5. Parts list.
 6. List of Extra Materials delivered to Owner; signed for by Owner's representative.
 7. Other items required by the Specifications.

1.04 OPERATION AND MAINTENANCE DATA

- A. Submittals: Submit two (2) draft copies of Operation and Maintenance Manuals for systems and equipment, including electrical and control items, and parts lists, a minimum of 14 days prior to requesting inspection for Substantial Completion, or scheduled Substantial Completion Date, whichever is earlier. Furnish separate copies for each Division.
1. Architect will review Manuals for general scope and content and return one copy of draft manuals with required action.

- B. Operating instructions shall include complete operating sequence, control diagrams, description of method of operating machinery, machine serial numbers, factory order numbers, parts, tests, instruction books, suppliers phone numbers, addresses, email addresses and individual equipment guarantees. Parts lists shall be complete in every respect, showing parts and part numbers for ready reference.
- C. Maintenance instructions shall include a written list of required and suggested maintenance for mechanical, plumbing, electrical or other equipment or features in the Project. Each item shall contain a brief description of maintenance required as well as the recommended time frame or period for maintenance. Include lists of filter sizes for air handling equipment, indicated "washable" or "disposable" and for which unit the filter is for.
- D. Provide DVD or Memory Key of all operating and maintenance instructions, or where available, provide manufacturer's own operations and maintenance DVD's/Memory Key of each specific equipment item or system.
- E. Assemble maintenance manual and operating instructions in hard back loose leaf binders. Suitably label and index material for ready reference.
- F. Upon substantial completion of the Project, submit three (3) copies of the Operation and Maintenance Manual and Parts Lists to the Architect for final approval. Upon receipt of Notice of Approval, deliver to the Owner.

1.05 SPARE PARTS AND MAINTENANCE MATERIALS

- A. Deliver spare parts, tools, extra stocks of material and similar physical items required by individual specification sections to the Owner with a copy of the transmittal to the Architect. Obtain signed receipts from the Owner for all items.

1.06 WARRANTIES

- A. Submit warranties required by individual specification Sections in duplicate, assembled in durable binders with a Table of Contents and a digital copy of same on DVD, Memory Key, or other similar electronic media.
- B. The date of commencement of warranties shall be the date of Substantial Completion except as may be modified by AIA Document G-704, Certificate of Substantial Completion, or by other written agreement with the Owner.

END OF SECTION

SECTION 02 41 00

DEMOLITION

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Demolition of portions of existing building and site improvements as follows:
 - 1. Partial demolition of existing building and structures indicated, including footings and foundations.
 - 2. Selective demolition of designated site structures, including pavements, curbs and gutters, drainage structures, signage and landscaping.
 - 3. Disconnecting, capping or sealing, and removing identified utilities indicated to be removed.
 - 4. Protection of existing building and utilities indicated to remain.
 - 5. Filling voids in subgrade created as a result of removals or demolition,
 - 6. Removal from site and legal disposal of demolition materials.

1.02 SUBMITTALS

- A. Permits and Notices: Submit copies of permits and notices authorizing demolition as may be required by law, including permits to transport and legally dispose of debris.
- B. Submit project record documents which accurately record actual locations of capped utilities and subsurface obstructions that will remain after demolition. Provide copies of Contractor's notes and drawings for "As-Built" drawings to Owner and appropriate governing agencies.

1.03 QUALITY ASSURANCE

- A. Demolition Firm Qualifications:
 - 1. Specializing in performing the Work required by this Section.
 - 2. Minimum 5 years documented experience.
 - 3. Utilizing workers experienced in disconnecting and capping utilities, as applicable.
- B. Regulatory Requirements:
 - 1. Conform to City of Prescott Specifications for demolition of structures, safety of adjacent structures, dust control, and runoff control.
 - 2. Cooperate with local authorities and local utility companies affected by the demolition operations and notify affected utility companies in sufficient time, prior to removal or capping operations. Ascertain the rules, regulations and requirements of these authorities that affect the demolition process. Disconnect or arrange for disconnections of utility services as necessary.
 - 3. Comply fully with all provisions of the local codes, laws and ordinances applicable to work of this Section and obtain required licenses and permits required for demolition operations and transport and legal disposal of all debris, including hazardous materials and waste. Pay all associated fees including disposal charges, at no additional cost to Owner.
 - 4. Construction and demolition debris or waste shall be disposed of in a licensed landfill, recycled, reused, or otherwise legally disposed of off-site.
 - 5. Conform to applicable regulatory procedures when hazardous or contaminated materials are discovered.
 - 6. Test soils around buried tanks for contamination.

1.04 PROJECT CONDITIONS

- A. Owner assumes no responsibility for actual condition of building and site to be demolished. Conditions existing at time of bidding will be maintained by Owner as far as practical.
- B. Existing building(s) to be demolished may contain hazardous materials. The Contractor is responsible for removal and legal disposal of all hazardous waste within existing buildings and structures to be demolished, including but not limited to refrigerants, fluorescent light tubes, ballasts, transformers, etc.
 - 1. Abatement of hazardous materials shall be performed by a qualified hazardous materials abatement contractor as part of Work of this Contract.
 - 2. Abatement contractor shall obtain all required permits and pay fees associated with abatement activities as required by governing regulatory agencies.
 - 3. Coordinate abatement activities and phase work as necessary for performance of general demolition operations, and in accordance with all governing regulations.
- C. All materials resulting from demolition operations, except where noted to be returned to Owner or re-used in new construction, shall become the property of the contractor and shall be removed from the site and disposed of in such a manner that public or private property will not be damaged or endangered.
- D. Items of salvageable value to Contractor shall be removed from site and structures. Storage or sale of removed items or materials on site will not be permitted and shall not interfere with other work specified in Contract Documents.
- E. Use of explosives are not allowed in demolition operations

PART 2 PRODUCTS

2.01 MATERIALS

- A. Unless specifically scheduled for reuse, demolished materials shall become the possession of the Contractor and shall be immediately removed from the site.
- B. Carefully remove (in whole or in part as indicated or required) and handle existing products and materials which are indicated to be salvaged for re-installation in the final Work, or delivered to Owner.
 - 1. Items indicated to be delivered to Owner shall be delivered to Owner's storage area as directed by Owner's Representative.
 - 2. Items indicated to be relocated or installed in the new Work shall be carefully removed, including associated installation hardware, and stored in protected location until time for re-installation. Any existing damage shall be documented with adequate written description and photographs and reported to Architect prior to removal. Items damaged during removal and storage shall be repaired and or replaced at no additional expense to Owner. Refer to Drawings for items to be salvaged for installation in the new Work. Items to be salvaged for installation in the new Work include, but are not limited to, the following:
 - a. Cabinets and countertops.
 - b. Refrigerator.
 - c. Electrical items noted.
 - d. Telephone boards and equipment as noted.
 - e. Electrical panel.
 - f. Fire alarm panel.

- g. Irrigation control valve.
 - h. Telephone box.
- 3. Items indicated to be returned to Owner include, but are not limited to, the following:
 - a. Existing building signage.

C. Fill Materials for Excavations: As specified in Section 31 01 00.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions and notify the Architect in writing of discrepancies before proceeding with the work.
- B. Employ a private utility-locator service to verify locations of existing utilities.
- C. When unanticipated mechanical, electrical, or structural elements that conflict with the intended demolition work are encountered, investigate and measure the nature and extent of the conflict. Promptly submit a written report to the Architect.
- D. Survey existing conditions and correlate with requirements indicated to determine extent of demolition required.
- E. Perform periodic surveys as work progresses to detect hazards resulting from demolition operations.
- F. Perform periodic surveys as work progresses to detect hazardous materials.

3.02 PREPARATION

- A. Obtain required environmental permits from the City of Prescott Department of Environmental Quality.
- B. Identify, disconnect, remove and seal or cap designated utilities within demolition areas as indicated on Drawings.
 - 1. Notify public utility companies serving the building in sufficient time, prior to removal operations, to permit them to shut-off, disconnect and remove their facilities.
- C. Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with demolition operations.
- D. Protect existing site improvements, landscape materials, and structures indicated to remain. Where existing materials indicated to remain are disturbed or damaged by selective demolition operations, remove damaged materials and replace with new materials to match existing at no additional cost to Owner.
- E. Mark location of utilities. Protect and maintain in safe and operable condition utilities that are to remain. Prevent interruption of existing utility service to occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities as acceptable to governing authorities and Owner.

- F. Prevent movement or settlement of adjacent construction and structure to remain. Provide bracing and shoring as necessary.
- G. Protect existing bench marks from damage and/or displacement.
- H. Obtain written permission from adjacent property owners when demolition equipment will traverse, infringe upon or limit access to their property.
- I. Do not close or obstruct streets, walks, or other public right-of-ways without permission of Owner and authorities having jurisdiction.
- J. Comply with requirements of Division 01 Temporary Facilities Sections, for environmental protection during demolition operations, temporary barriers, temporary security devices, and other temporary facilities and controls.

3.04 STRUCTURE DEMOLITION

- A. Conduct demolition to minimize interference with adjacent structures or pavements indicated to remain.
- B. Begin demolition at top of building and proceed to lowest basement floor, without using explosives unless proper approvals and permits are obtained from authorities having jurisdiction and building Owner.
- C. Demolish portions of building indicated to be removed completely and remove from the site. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Dispose of demolished items and materials promptly. Do not allow demolished materials to accumulate on-site.
 - 2. Demolish concrete and masonry in small sections.
 - 3. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 - 4. Break up and remove concrete slabs on grade, unless otherwise shown to remain.
 - 5. Remove air-conditioning equipment without releasing refrigerants.
 - 6. Any hazardous materials encountered shall be properly abated/removed and disposed of in a legal manor in accordance with regulatory requirements specified by a qualified and certified abatement contractor.
 - 7. Coordinate abatement activities and schedule work as necessary with other demolition and new construction activities to avoid delay of work.
- D. Remove foundation walls and footings in their entirety, unless indicated to remain.
- E. Items, materials or portions of existing construction and site improvements that are designated to remain intact shall be protected and carefully worked around during the demolition work. Saw-cut existing concrete curbs, gutters, walks, walls and similar materials where portions are indicated to remain. Refer to Division 32 Sections for cutting and patching concrete curbs, gutters, walks and pavements.
- F. Empty buried tanks located within demolition area and properly dispose of contents. Remove buried tanks, components, and piping from site. Prior to bidding, verify with Owner if testing for soil contamination is required. Testing and removal of contaminated soil and disposal shall be the responsibility of the Contractor.
- G. Backfill areas excavated and open pits, voids and holes resulting from demolition operations in accordance with Section 31 01 00 and as shown on Drawings.

- H. Rough grade and compact areas affected by demolition to maintain site grades and contours unless noted otherwise on Drawings.
- I. Do not burn demolished materials.
- J. Keep site clean of dust and debris. Limit dust to lowest practicable level by sprinkling with water. Comply with Section Division 01 Temporary Controls.
- K. Material Disposal:
 - 1. Remove materials from site and dispose of in a legal manner off-site to areas that are approved for disposal by governing authorities at no additional expense to Owner. Leave areas of Work in clean, neat condition.
 - 2. No materials are to be sold on, or adjacent to, the site. Signs advertising the sale of materials shall not be allowed.
 - 3. Burning of materials on site is not permitted.
 - 4. Break concrete and masonry into sections less than 3 feet in any dimension.
 - 5. Remove from site, contaminated, vermin infested, or dangerous materials encountered and dispose of by safe means so as not to endanger health of workers and public in accordance with applicable regulations.
 - 6. Debris from the demolition shall not be allowed to accumulate within the building or on the site.
 - 7. Arrange and pay for all required hauling, storage, collection and disposal. Contractor is responsible for any waste characterization that may be required by waste receiver.
 - 8. Transport demolished materials using appropriate vehicles.
 - 9. Provide documentation as to proper handling, transport, and disposal of material removed from demolished structures to Owner.
- L. Clean adjacent properties, buildings and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing before start of demolition.

END OF SECTION

SECTION 03 05 05

FLY ASH

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Fly ash admixture for incorporation into concrete mixes specified in the following specification sections:
 - 1. Section 32 16 00 - Concrete Curbs, Gutters, Sidewalks and Driveways.
 - 2. Section 03 30 00 - Cast-In Place Concrete.
 - 3. Section 04 05 15 - Mortar and Masonry Grout.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Coal Fly Ash and Raw or Calcined Natural Pozzolan
 - 1. Sampled and tested in accordance with the current edition of ASTM C 311, Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use as a Mineral Admixture in Portland-Cement Concrete.
 - 2. Conform to the requirements of the current edition of ASTM C 618, Standard Specification of Coal Fly Ash and Raw and Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete, as follows:
 - a. Meet the requirements of ASTM C 618, Table 1 Chemical Requirements and Table 1A Supplementary Optional Chemical Requirements.
 - b. Meet the requirements of ASTM C 618, Table 2 Physical Requirements and Table 2A Supplementary Optional Physical Requirements in the following areas:
 - 1) Effectiveness in Controlling Alkali-Silica Reaction.
 - 2) Effectiveness in Contributing to Sulfate Resistance, Procedure A.
 - 3) Uniformity Requirements when air-entraining concrete is specified:
 - 3. Source Quality Control:
 - a. Fly ash shall come from sources with an established quality control program to demonstrate that the fly ash consistently conforms to ASTM C 618 specification and uniformity requirements. The quality history shall include a minimum of 40 test results representing a minimum of the previous 6 months production of fly ash.
 - b. Per the current edition of ACI 232, Use of Fly Ash in Concrete, section 5.6, the fly ash quality history shall be available that demonstrates at least monthly ASTM C 618 certification results from a Cement and Concrete Reference Laboratory (CCRL) accredited laboratory. A minimum of 20 reports representing at least 6 months of fly ash production is required.

2.02 MIXES

- A. Provide fly ash admixture for incorporation into concrete mixes as specified in the following specification sections:
 - 1. Section 32 16 00 - Concrete Curbs, Gutters, Sidewalks and Driveways.
 - 2. Section 03 30 00 - Cast-In Place Concrete.
 - 3. Section 04 05 15 - Mortar and Masonry Grout.

- B. Proportioning:
1. Per ACI 232, Use of Fly Ash in Concrete, section 4.1, the most effective method for proper proportioning of concrete for a specific application is by use of a trial batch and testing program per ACI 211.1, Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete. When necessary, a series of mixtures shall be prepared and tested to determine the proper proportions for the specific project requirements.
 2. Fly ash shall when used shall not replace more than 20 percent of cement by weight in accordance with General Structural Notes on Structural Drawings.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 03 10 00
CONCRETE FORMWORK

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Formwork for cast-in-place concrete, including, but not limited to:
 - 1. Shoring, Bracing and Anchorage, including openings for other Work
 - 2. Form Accessories
 - 3. Form Stripping.

1.02 DESIGN REQUIREMENTS

- A. Design, engineer and construct formwork, shoring and bracing to conform to design and code requirements; resultant concrete to conform to required shape, line and dimension.

1.03 SUBMITTALS

- A. Shop Drawings: Show form construction including jointing and other items that affect exposed concrete visually. The Architect's review is for general architectural applications and features only. Designing formwork for structural stability and efficiency is the Contractor's responsibility. Submit Drawings showing dimensions, materials, bracing, tie-hole layouts for exposed tie holes, and arrangement of joints for exposed to view architectural finish concrete.
- B. Product Data: Provide data on accessory materials and installation requirements.

1.04 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 347R - Guide to Formwork for Concrete.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, protect and handle products to site to prevent deterioration and damage.
- B. Store off ground in ventilated and protected manner to prevent deterioration from moisture.

1.06 COORDINATION

- A. Coordinate this Section with other Sections of Work which require attachment of components to formwork.
- B. If formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement, request instructions from Architect's Structural Engineer before proceeding.

PART 2 PRODUCTS

2.01 FORM MATERIALS

- A. Forms for Concealed Concrete: Plywood, metal, or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit. For use in below grade concrete or concrete covered by another finish. Not for use where finished concrete is exposed to view.
 - 1. Plywood, Douglas Fir species; APA grade-trademarked; BB Plyform, Class 1, Exterior Grade as per PS1.
 - 2. Lumber: Spruce, Pine or Fir species; construction grade, with grade stamp clearly visible.
 - 3. Plywood shall have mill applied release agent and edge seal.
- B. Forms for Exposed Concrete: Plywood, MDO, tempered concrete-form-grade hardboard, metal, metal-framed plywood faced, or other acceptable panel-type materials to provide continuous, straight, smooth, exposed surface. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system where shown on Drawings. For use in exposed to view concrete that is not covered by another finish.
 - 1. MDO (medium density overlay), class 1 or better, with mill applied release agent and edge seal.
 - 2. Use overlaid plywood complying with U.S. Product Standard PS-1 "A-C of B-B High Density Overlaid Concrete Form," Class I.
 - 3. Tempered concrete-form-grade hardboard, with applied release agent and edge seal.
 - 4. MDO, plywood, and hardboard forms shall have mill applied release agent and edge seal.
- C. Forms for Cylindrical Columns and Supports. Metal, glass-fiber-reinforced plastic, or paper or fiber tubes that will produce smooth surfaces without joint indications. Provide units with sufficient wall thickness to resist wet concrete loads without deformation.
- D. PVC Sleeves: ASTM D1758, PVC 1120 compound, Schedule 40.

2.02 FORMWORK ACCESSORIES

- A. Form Release Agent: 100 percent biodegradable, zero VOC, vegetable base, colorless, which will not stain concrete, or impair natural bonding or color characteristics of coating intended for use on concrete.
 - 1. Do not use petroleum-based agents. Paraffin and waxes shall not be used when a concrete finish is required.
- B. Corners: Chamfered wood strip type or vinyl bead; 3/4 inch x 3/4 inch size; maximum possible lengths.
- C. Flashing Reglets: Galvanized steel 22 gauge thick, longest possible lengths, with alignment splines for joints, foam filled, release tape sealed slots, anchors for securing to concrete formwork.
- D. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with Drawings.

3.02 EARTH FORMS

- A. Hand trim sides and bottom of earth forms. Remove loose soil in pour cavity prior to placing concrete.

3.03 ERECTION - FORMWORK

- A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.
- B. Arrange formwork for exposed concrete in an orderly and symmetrical manner to produce smooth concrete finish indicated where exposed to view in the finished work.
- C. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.
- D. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping.
- E. Align joints and make watertight. Keep form joints to a minimum.
- F. Obtain approval from Architect before framing openings in structural members which are not indicated on Drawings.
- G. Provide chamfer strips on external corners where exposed in the finished Work.
- H. PVC Sleeves: Set PVC sleeves in proper alignment and position. End of sleeves shall be flush with finished concrete surface.

3.04 APPLICATION - FORM RELEASE AGENT

- A. Apply form release agent on formwork in accordance with Manufacturer's recommendations.
- B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
- C. Do not apply form release agent where concrete surfaces will receive applied coverings which are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.05 INSERTS, EMBEDDED PARTS, AND OPENINGS

- A. Provide formed openings where required for items to be embedded in or passing through concrete work.
- B. Locate and set in place items which will be cast directly into concrete.

- C. Coordinate Work of other Sections in forming and placing openings, slots, reglets, recesses, chases, sleeves, bolts, anchors, and other inserts.
- D. Install accessories in accordance with Manufacturer's instructions, straight, level and plumb. Ensure items are not disturbed during concrete placement.
- E. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.
- F. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

3.06 FORM CLEANING

- A. Clean and remove foreign matter within forms as erection proceeds.
- B. Clean formed cavities of debris prior to placing concrete.
- C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.

3.07 FORMWORK TOLERANCES

- A. Design and construct formwork in accordance with ACI 301.
- B. Construct formwork as required to produce concrete members of size, shape, configuration, alignment, elevation and position indicated on Drawings within tolerance limits of ACI 301.
- C. Surface Irregularities: Construct and maintain formwork to produce concrete having the following formed finish Class and permitted abrupt or gradual irregularities as designated by ACI 347-01.
 - 1. All vertical and horizontal exterior exposed surfaces: Class A, 1/8 inch.
 - 2. Other surfaces prominently exposed to public view: Class A, 1/8 inch.
 - 3. Concealed surfaces where covered by another finish: Class C, 1/2 inch, except abrupt irregularities shall be limited to 1/4 inch.

3.08 FIELD QUALITY CONTROL

- A. Inspect erected formwork, shoring, and bracing to ensure that Work is in accordance with formwork design, and that support, fastenings, wedges, ties and items are secure.
- B. Do not reuse wood formwork more than 3 times for concrete surfaces to be exposed to view. Do not patch formwork.

3.09 FORM REMOVAL

- A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads. Forms shall be removed in accordance with the requirements of the General Structural Notes.
- B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
- C. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

- D. Forms for retaining walls shall not be removed or disturbed for at least 14 days from date of last placement. It may be required that such forms be left in place longer than the above specified period. The length of time they shall remain in place will depend on the system of forming and shoring, and shall be in accordance with the requirements of the General Structural Notes.
- E. Formwork for stem walls and other parts not supporting the weight of the concrete may be removed as soon as the concrete has hardened sufficiently to resist damage.
- F. Cure exposed concrete in accordance with Section 03 30 00 whenever the formwork is removed during the curing period.

3.10 REMOVAL STRENGTH

- A. When formwork removal is based on the concrete reaching its specified 28 day strength (or a specified percentage thereof), the concrete shall be presumed to have strength when either of the following conditions has been met:
 - 1. When test cylinders, field cured under the most unfavorable conditions prevailing for any portion of the concrete represented, have reached the required strength.
 - 2. When the concrete has been cured for the same length of time as the age, at test, of laboratory cured cylinders which reach the required strength. The length of time concrete has been cured in the field shall be determined by the cumulative number of days or fractions thereof, not necessarily consecutive, during which the temperature of the air in contact with the concrete is above 50 degrees F. and the concrete has been damp or thoroughly sealed from evaporation and loss of moisture.

END OF SECTION

SECTION 03200

CONCRETE REINFORCEMENT

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Concrete reinforcement as shown on the Drawings and as specified.

1.02 QUALITY ASSURANCE

- A. Comply with ACI-301, Chapter 5, except where more exacting requirements are specified.
- B. Comply with requirements in AWS-D12.1, except where more exacting requirements are specified in the Contract Documents.

1.03 SUBMITTALS

- A. Shop Drawings: Submit Drawings showing bending and placing of reinforcing. Include diagrammatic elevations of walls at a scale sufficiently large to show clearly the position and erection marks of marginal bars and their dowels and splices and bar arrangement for more than one layer of reinforcing steel in concrete sections.
- B. Certificates: Submit certified mill test reports for review prior to fabrication.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Shipping: Deliver reinforcement to the Project site bundled, tagged and marked to facilitate sorting and placing. Tags shall indicate bar sizes, lengths, grade and other information corresponding to markings shown on placement diagrams.
- B. Storage and Protection: Store reinforcement at the site off the ground and in a manner to prevent damage to the materials.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Reinforcing Steel: New billet-steel, deformed bars conforming to ASTM A615, Grade 60, with a minimum yield of 60 ksi for all bars No. 5 and larger and ASTM A615, Grade 40 for all bars No. 4 and smaller, unless noted otherwise on Drawings. Grade 60 bars indicated to be welded shall be ASTM A706.
- B. Chairs: Galvanized steel or plastic tipped.
- C. Tie Wire: ASTM A82, 16 gauge or heavier, black annealed.
- D. Welding Rods: E-70 Series for A615 Grade 40 (ASTM A615M, Grade 300) reinforcing, and E-90 Series for A706 reinforcing; low hydrogen conforming to AWS A-5.1.

2.02 FABRICATION

- A. Shop fabricate bars as far as is practical. Bend bars cold. Make bends for stirrups and ties around pins having diameters at least 2 times the thickness of the bars; for other bars 1 inch diameter and smaller, 6 times the thickness; for larger bars 8 times the thickness.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Determine weldability of reinforcing steel by laboratory chemical analysis of steel. Only steel conforming to chemical requirements specified in AWS D12.1 may be welded.

3.02 PLACING REINFORCEMENT

- A. General:
 - 1. Place in accordance with ACI 318 and as shown.
 - 2. Accurately place reinforcement and securely tie at intersections with 16 gauge black annealed wire.
 - 3. Maintain reinforcing in proper position by chairs, bar supports or other approved devices.
 - 4. Bars in footings shall be supported on precast concrete blocks.
 - 5. The bending or field cutting of bars around openings or sleeves will not be permitted.
- B. Splices shall be Class B tension splices (minimum length of 2'-0") per ACI 318 unless noted otherwise on Drawings. Stagger a minimum of one lap length. Hook horizontal bars around corners not less than 24 diameters, with a minimum of 12 inches as per typical details. All splice locations are subject to approval by the Structural Engineer.
- C. Concrete protection of reinforcing shall be not less than the following:
 - 1. Concrete is poured against and permanently exposed to ground: 3 inches.
 - 2. Concrete is poured against forms but may be in contact with ground:
 - a. #5 and under: 1-1/2 inches.
 - b. #6 and larger: 2 inches.
- D. Clear distance between bars shall be not less than 1-1/2 times the maximum size of coarse aggregate unless noted otherwise.
- E. Bars may be moved as necessary to avoid interference with other reinforcing steel, conduits or embedded items. If bars are moved more than one bar diameter or enough to exceed code tolerances, resulting arrangement of bars shall be subject to review of Architect.
- F. Bars with kinks or bends not indicated shall not be used. Reinforcement shall not be bent or be straightened in a manner that will weaken the material, or be bent after being partially embedded in hardened concrete.

3.03 CLEANING

- A. During the course of the Work and on completion, remove excess materials, equipment and debris and dispose of off premises. Leave Work in clean condition.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Cast-in-place concrete including, but not limited to, the following:
 - 1. Building footings, foundations and slabs on grade.
 - 2. Site structures including, but not limited to, site lighting supports, electrical and mechanical equipment support pads, and other site furnishing and equipment requiring cast-in-place concrete items.
- B. Related Sections:
 - 1. Section 03 10 00 – Concrete Formwork
 - 2. Section 03 20 00 – Concrete Reinforcement
 - 3. Section 32 16 00 – Concrete Curbs, Gutters, Sidewalks and Driveways

1.02 SYSTEM DESCRIPTION

- A. Performance Requirements: Interior slabs on grade scheduled to receive applied floor finishes (wood flooring, resilient flooring, carpet, etc.) shall be tested as specified herein under Field Quality Control Calcium chloride test requirements. Moisture vapor from the floor must be less than 3 pounds per 1,000 square feet per 24 hours.

1.03 SUBMITTALS

- A. Mix Design: Submit mix design for each class of concrete to the Architect for review. Review of mix designs by Architect and/or Engineer shall in no way relieve the Contractor of responsibility for the performance of the concrete.
- B. Product Data: Submit Manufacturer's Specifications and performance data for accessory products.
- C. Shop Drawings: Submit shop drawing showing proposed location of construction joints, expansion/contraction joints and control joints and obtain approval of same from Architect prior to construction.

1.04 QUALITY ASSURANCE

- A. Standards:
 - 1. Standard for measuring, mixing, transporting and placing of concrete shall be ACI-301 and ACI-304.
 - 2. Standard for measuring, mixing and delivery of ready mixed shall be ASTM C94, except that time in mixer after water has been added at batch plant is limited to 1-1/2 hours.
 - 3. Job-mixed concrete shall be subject to Architect's review of design, mixing and handling procedures.
- B. Pre-Installation Conference:
 - 1. Contractor shall conduct a meeting at Project site to review proposed mix designs and discuss required methods and procedures to achieve required concrete construction.

2. Contractor shall distribute meeting agenda to all attendees a minimum of 7 days prior to the scheduled date meeting.
 3. Attendees: Responsible representatives of every party who is concerned with the concrete work to attend the conference, including but not limited to the following:
 - a. Contractor's superintendent.
 - b. Laboratory responsible for concrete design mix.
 - c. Laboratory responsible for field quality control.
 - d. Concrete subcontractor.
 - e. Ready-mix concrete producer.
 - f. Admixture manufacturer(s).
 - g. Concrete placement equipment manufacturer(s).
 4. Meeting minutes will be taken by the Contractor for distribution to all attendees within 5 days of meeting. Contractor shall also distribute copy of meeting minutes to Owner, Structural Engineer, and Architect.
 5. Minutes shall include statement by concrete subcontractor indicating proposed mix design, placement, finishing and curing procedures can produce the concrete quality required by these specifications.
- C. Static Coefficient of Friction: Sealed concrete floors shall have a tested coefficient of friction of 0.71 minimum dry, 0.6 minimum wet for level surfaces and treads of stairs and 0.8 minimum wet or dry for ramp surfaces when tested in accordance with ASTM D2047 / UL410.

1.05 PROJECT CONDITIONS

- A. Rain protection: Do not place concrete during rain unless adequate protection has been provided.
- B. Cold weather protection: Comply with ACI-306R.
- C. Hot weather protection: Comply with ACI-305R and 305.1-06.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Portland Cement: ASTM C150, Type II, alkali content not to exceed 0.6 percent. Use one brand and type of cement throughout Project unless otherwise specified.
- B. Aggregate: Clean, coarse aggregate and gravel, free from foreign matter, conforming to ASTM C33. Aggregate shall be graded from coarse to fine in accordance with ASTM C33, Size 67.
- C. Admixtures:
 1. Air-Entraining Admixture: ASTM C260, certified by manufacturer to be compatible with other required admixtures. Provide one of the following:
 - a. AEA-92 and Air 40, Euclid Chemical Co. www.euclidchemical.com
 - b. Sika AER, Sika Corp. www.sikaconstruction.com
 - c. Master Builders MB-VR or MB-AE, BASF Admixtures www.basf-admixtures.com
 2. Water-Reducing Admixture: ASTM C494, Type A, and containing not more than 0.05 percent chloride ions. Provide one of the following:
 - a. Eucon NW or Eucon WR 91, Euclid Chemical Co.
 - b. Master Builders Pozzolite 322N, BASF Admixtures
 - c. Plastocrete 160, Sika Chemical Corp.

3. High-Range Water-Reducing Admixture (Superplasticizer): ASTM C494, Type F or Type G and containing not more than 0.05 percent chloride ions. Provide one of the following:
 - a. Eucon 37/Eucon 1037, or Plastol Series, Euclid Chemical Co.
 - b. Daracem 100 or ADVA Flow, W.R. Grace & Co.
 - c. Master Builders Rheobuild 1000 or Glenium 3030, BASF Admixtures.
4. High-Range, Water-Reducing, and Retarding (Superplasticizer): ASTM C 494, Type G. Provide one of the following:
 - a. Eucon 537, Euclid Chemical Company
 - b. Daracem 100, W.R. Grace & Co.
 - c. Master Builders Rheobuild 916, BASF Admixtures
5. Non-Chloride, Non-Corrosive Accelerating Admixture: The admixture shall conform to ASTM C494, Type C or E, and not contain more chloride ions than are present in municipal drinking water. The admixture manufacturer must have long-term non-corrosive test data from an independent testing laboratory (of at least a year's duration) using an acceptable accelerated corrosion test method such as that using electrical potential measures. Provide one of the following:
 - a. Accelguard 80, 90 or NCA, Euclid Chemical Co.
6. Water-Reducing, Retarding Admixture: ASTM C494, Type D, and contain not more than 0.05 percent chloride ions. Provide one of the following:
 - a. Eucon NR or Eucon Retarder 100, Euclid Chemical Co.
 - b. Master Builders Pozzolith Retarder, BASF Admixtures.
 - c. Plastiment, Sika Chemical Co.
7. Fly ash admixture: In accordance with Section 03 05 05.
8. Use set-retarding admixtures during hot weather only when approved by Architect.
9. Prohibited Admixtures: Calcium chloride, thiocyanates or admixtures containing more than 0.05 percent chloride ions are not permitted.

D. Water: Potable.

2.02 ACCESSORIES

A. Bonding Agents and Repair Products:

1. Interior Only (PVA): L&M Construction Chemicals EVERWELD www.lmcc.com; EucoWeld, Euclid Chemical Company www.euclidchemical.com; US Spec Bondcoat PVA www.usspec.com; or Larsens' Weld Crete www.larsenproducts.com
2. Interior Only for Bonding Existing Concrete to Fresh Concrete (Epoxy): Sikadur 32, Hi-Mod, Sika www.sikausa.com; Euco 452 Series, Euclid Chemical Company www.euclidchemical.com; Maxi-Bond 2500, US Spec www.usspec.com; or Rezi-Weld, W.R. Meadows www.wrmeadows.com.
3. Exterior and Interior Bonding Admixture (acrylic latex): SBR Latex or Flexcon Euclid Chemical Company www.euclidchemical.com; Intralok, W.R. Meadows www.wrmeadows.com; Acylcoat, US Spec www.usspec.com; or Dayton Bond J40, Dayton Superior www.daytonsuperior.com.
4. Polymer Repair Compounds: Polymer and microsilica modified cementitious based compounds.
 - a. Acceptable Products: Subject to compliance with requirements, provide one of the following:
 - b. Horizontal Locations:
 - 1) Sikatop 121 or 122, Sika Chemical www.sikausa.com
 - 2) Thin Top Supreme, Concrete Top Supreme, Euclid Chemical Company www.euclidchemical.com
 - 3) TP Mortar, US Spec www.usspec.com

5. Underlayment Topping: Free-flowing, self-leveling, pumpable cementitious base compound.
 - a. Acceptable Products: Subject to compliance with requirements, provide one of the following:
 - 1) Ardex K-15, Ardex Inc.
 - 2) Flo-Top or Super Flo-Top, Euclid Chemical Company
 - 3) Self-Leveling Underlayment, US Spec
 - 4) Underlayment 110, BASF
 6. Repair Topping: Latex modified, sandless cementitious mortar topping with bond strength meeting or exceeding requirements of ASTM C1059.
 - a. Acceptable Products: Subject to compliance with requirements, provide one of the following:
 - 1) Thin Top Supreme, Euclid Chemical Company
 - 2) TP Mortar, US Spec
 - 3) As approved by Architect.
- B. Non-Shrink Grout:
1. Premixed or prepackaged, non-metallic, non-gaseous, bleed free compound; non-shrink when tested in accordance with ASTM C 1107, Grade B at a fluid (flow cone) consistency of 20 to 30 seconds.
 2. Attain minimum compressive strength of 7,000 psi in 28 days at above fluid consistency.
 3. Fluid grouts: Remain workable, flow through flow cone after 20 minutes with slight agitation, in temperatures from 40 to 70 degrees F.
 - a. Acceptable Products: Subject to compliance with requirements, provide one of the following:
 - 1) Suregrip High Performance, Dayton Superior, www.daytonsuperior.com
 - 2) Sikagrout 212, Sika www.sikausa.com
 - 3) Master Builders (Masterflow 713) www.masterbuilders.com
 - 4) W.R. Meadows No. 588 Grout www.wrmeadows.com
 - 5) L&M Construction Chemicals (DURAGROUT) www.lmcc.com
 - 6) US Spec "GP Grout" www.usspec.com
 - 7) Euclid N-S Grout www.euclidchemical.com.
 4. High Flow Fluid Grouts: High flow grout shall achieve 95 percent contact when placed under an 18 inch x 36 inch base plate, remain workable, and flow through cone after 60 minutes in temperature from 70 to 90 degrees F.
 - a. Acceptable Products: Subject to compliance with requirements, provide one of the following:
 - 1) Hi-Flo Grout, Euclid Chemical Company www.euclidchemical.com
 - 2) US Spec "MP Grout" www.usspec.com
 - 3) Chemrex Masterflow 928, BASF www.chemrex.com
- C. Epoxy Anchoring Adhesive: 2-component, high modulus, 100 percent solids epoxy gel adhesive complying with ASTM C881.
1. Acceptable Products: Subject to compliance with requirements, provide one of the following:
 - a. Hilti HIT-RE 500-SD www.hilti.com
 - b. Simpson Strong-Tie Co. Set-XP www.simpsonanchors.com.
- D. Formed Construction Joint: Standard design plastikey, tongue and groove key joint; 3-1/2 inch vertical dimension for 4 inch slabs. For use only in slabs not exposed to vehicular traffic.
- E. Preformed Expansion Joint Filler: ASTM D1751.

- F. Liquid Curing and Sealing Compound:
1. Verify that specified curing compound is compatible with the floor finish material(s) and adhesive(s) that will be applied to floor surface prior to delivery of curing compound to jobsite. If it is determined that the curing compound is not compatible with the floor finish material(s) and adhesive(s) that will be applied to floor surface, Contractor shall immediately notify Architect.
 2. Dissipating Hydrocarbon Resin Curing Compound: ASTM C309, VOC compliant, 350 g/l, for use on slabs receiving subsequent applied finishes and where noted on Drawings. Subject to compliance with requirements, provide one of the following:
 - a. Kurez DR VOX or Kurez W VOX, Euclid Chemical Company www.euclidchemical.com
 - b. Maxcure Resin Clear HS, US Spec www.usspec.com
 3. Clear Curing and Sealing Compound (Voc Compliant, 350 g/l): Liquid type membrane-forming curing compound, clear styrene acrylate type, complying with ASTM C1315, Type I, Class A, 25% solids content minimum. Moisture loss shall be not more than 0.40 Kg/m² when applied at 300 sq. ft./gal. Manufacturer's certification is required. Subject to project requirements provide one of the following products:
 - a. Chemrex Kure 1315, BASF Construction Chemicals www.chemrex.com.
 - b. Lumiseal WB, L&M Construction Chemicals www.lmcc.com
 - c. Radiance UV-25, US Spec www.usspec.com
 - d. Super Diamond Clear VOX, Euclid Chemical Company www.euclidchemical.com
 - e. VOCCOMP-30, W.R. Meadows www.wrmeadows.com
- G. Sealer: VOC compliant, acrylic copolymer type.
1. Interior: ASTM C1315, Class A. Subject to requirements, Provide one of the following:
 - a. VOCOMP-30, W. R. Meadows.
 - b. Euclid Super Aqua Cure VOX, Euclid Chemical Company.
 - c. Dress & Seal WB #30, L&M Construction Chemicals.
 - d. J-19, Dayton Superior.
 2. Exterior: ASTM C1315, Class A. Provide one of the following:
 - a. Euclid Super Diamond Clear VOX, Euclid Chemical Company.
 - b. Lumiseal WB, L&M Construction Chemicals.
 - c. VOCOMP-30, W. R. Meadows.
 - d. Radiance UV-25, US Spec.
- H. Leveling Agent: Sonneborn Sonoflow, Euclid Flo-Top, Ardex K-15, L&M Construction Chemicals Levelex, US Spec "Self-Leveling Underlayment, or Dayton-Superior Levelayer 1 are acceptable products.
- I. Vapor Barrier: ASTM E1745, Meets or exceeds Class A, manufactured from prime virgin resins and complying with the following:
1. Permeance Rating:
 - a. New Material: Less than 0.01 perms (gr/ft²/hr/in-Hg) when tested in accordance to ASTM E96 or ASTM F1249.
 - b. After Mandatory Conditioning: Less than 0.01 perms (gr/ft²/hr/in-Hg) when tested in accordance with ASTM E154, Sections 8, 11, 12 and 13.
 2. Minimum Thickness: 10 mils in accordance with ACI 302.2R-06.
 3. Puncture Resistance: Minimum 2200 grams when tested in accordance with ASTM D1709.
 4. Tensile Strength: Minimum 45.0 lbf/in when tested in accordance with ASTM D882.

- 5. Acceptable Products:
 - a. Stego Wrap (15 mil) vapor Barrier, Stego Industries, L.L.C., (877) 464-7834 www.stegoindustries.com
 - b. Vaporguard, Reef Industries www.reefindustries.com
- 6. Accessories:
 - a. Seam Tape and Mastic: Provide manufacturer's recommended seam tape and vapor proofing mastic with WVTR of 0.3 perms or lower when tested in accordance with ASTM E96.
 - b. Pipe Boots: Construct boots from vapor barrier material, pressure sensitive tape and/or mastic in accordance with manufacturer's instructions.
- J. Concrete Accessories: Gateway Engineering Company, Dayton-Superior Corporation, or Burke Concrete Accessories.
- K. Evaporation Retarder:
 - 1. Type: Monomolecular film, compatible with subsequent coatings and floor finishes.
 - 2. Acceptable Manufacturer and Products: L&M Construction Chemicals (E-Con), Master Builders (Confilm), Sika (Sika Film), W.R. Meadows (Evapre), US Spec (Monofilm ER), or Dayton Superior (Surefilm J-74)."

2.03 MIXES

- A. Design of Mixes: All mix designs shall be prepared in accordance with ACI 318-05, "Building Code Requirements for Structural Concrete", Section 5.3, "Proportioning on the Basis of Field Experience or Trial Mixtures".
- B. Selection of proportions for normal weight concrete: ACI 301.
- C. Mix and deliver ready-mixed concrete in accordance with requirements of ASTM C94, Option A.
 - 1. Not more than 90 minutes shall elapse from time water is introduced into the concrete mixture until completion of placement.
 - 2. Do not add water to mix that has stiffened to increase its workability.
 - 3. At no time shall concrete mix exceed a bulb thermometer reading of 90 degrees F. or over.
 - 4. Use ice or other method as reviewed by Architect, to keep concrete below 90 degrees F. temperature.
- D. All concrete must contain the specified water-reducing admixture or the specified high-range water-reducing admixture (superplasticizer). All thin concrete slabs, less than 8 inches in thickness placed at air temperatures below 50 degrees F shall contain the specified non-corrosive, non-chloride accelerator. All concrete slabs placed at air temperatures above 90 degrees F may require the use of a water reducing retarding admixtures.
- E. All concrete required to be air entrained shall contain an approved air entraining admixture. All pumped concrete, concrete for industrial slabs, synthetic fiber concrete, architectural concrete, self-consolidating concrete, concrete required to be watertight or concrete with a water/cement ratio below 0.50 shall contain the specified high-range water-reducing admixture (superplasticizer).

- F. Durability Requirements - Water/Cementitious Ratio:
 - 1. All concrete subject to freezing and thawing shall have a maximum water/cementitious ratio of 0.45 (4500 psi at 28 days or more).
 - 2. Water-cement ratio for concrete used for interior slab on grade construction: 0.40 to 0.45.
- G. Air Entraining Admixture: All concrete exposed to freezing and thawing and/or required to be watertight shall have an air content of 4.5 to 7.5 percent in accordance with ACI 212.3R. All interior, slabs subject to vehicular abrasion, shall have a maximum air content of 3 percent.
- H. Compressive strength (28 day): As shown on Drawings.
- I. Slump, for consolidation by vibration: As shown on Drawings.

PART 3 EXECUTION

3.01 PREPARATION

- A. Prior to placing concrete:
 - 1. Clean equipment involved.
 - 2. Remove debris and foreign material from the forms.
 - 3. Remove concrete laitance from reinforcing steel.
 - 4. Wet wood forms and masonry units in contact with concrete.
- B. No wood will be permitted to remain permanently inside the forms.
- C. Coordinate the necessary Trades as required to provide the sleeves, bolts, anchors, holes, etc., to be built in.
- D. Place vapor retarder over subbase immediately prior to placing of floor slab.
 - 1. Install vapor retarder in accordance with ASTM E1643-98 (2005) and manufacturer's printed instructions.
 - 2. Unroll vapor barrier/retarder with the longest dimension parallel with the direction of the pour.
 - 3. Lap vapor barrier/retarder over footings or seal to foundation walls.
 - 4. Vapor barrier/retarder shall be continuous over entire floor area and turned up a minimum of 2 inches at perimeter walls and penetrations.
 - 5. Overlap joints 6 inches and seal with manufacturer's tape.
 - 6. Seal all penetrations (including pipes) per manufacturer's instructions.
 - 7. No penetration of the vapor barrier/retarder is allowed except for reinforcing steel, structural members and permanent utilities.
 - 8. Repair damaged areas by cutting patches of vapor barrier/retarder, overlapping damaged area 6 inches and taping all four sides with tape.
 - 9. Vapor barrier/retarder installation shall be approved by the vapor barrier manufacturer prior to concrete placement.

3.02 PLACING OF CONCRETE

- A. Concrete Work shall be performed in accordance with ACI-301 except as amended by this Section.

- B. Convey concrete from the mixer to place of final deposit by methods which will prevent segregation of aggregate or loss of material. Place concrete at such a rate that concrete is at all times plastic and to insure a practically continuous flow of concrete. Concrete not in place 1-1/2 hours after water has been added at batch plant may be rejected by Architect.
- C. Place concrete as nearly as practicable in its final position to avoid segregation due to rehandling or flowing. Do not deposit concrete that has partially hardened or been retempered.
- D. Do not place concrete during rain unless adequate protection has been provided.
- E. Thoroughly compact concrete by suitable means during the placing, and work around the reinforcement and embedded items into the corners of the forms.
 - 1. Use vibrators to aid in the placement of the concrete, operated by experienced personnel.
 - 2. Keep at least one spare operating vibrator on the job at all times during the concrete operations.
- F. Self-Consolidation concrete does not require vibration.
- G. Set reinforcing dowels connecting new concrete construction to existing with epoxy anchoring adhesive as indicated on Structural Drawings.

3.03 CONSTRUCTION, EXPANSION, AND CONTRACTION JOINTS

- A. Construction Joints: Provide as required to facilitate construction in accordance with reviewed shop drawings.
- B. Expansion and Contraction Joints: Place expansion and contraction joints where required to ensure that undesirable thermal and shrinkage cracking of slabs is minimized.
 - 1. See Drawings for locations of expansion and contraction joints in slabs-on-grade and in topping pours.
 - 2. If drawings do not indicate locations, verify with Architect prior to placement of slabs-on-grade and topping pours.
 - 3. Utilize early entry saw-cutting techniques using specialized equipment and procedures in accordance with the manufacturer of the saw-cutting equipment to saw-cut all joints in interior and exterior slabs within 2 hours of final finishing of the floor slabs while the concrete is still in its early green state.
 - a. Acceptable Equipment: Soff-Cut International, Inc., Corona, CA 1-800-776-3328 www.soffcut.com
 - 4. At exterior slabs-on-grade provide a 1/2 inch wide expansion joint wherever slabs abut vertical construction elements whether indicated or not.
- C. Additional reinforcing may be required at some construction, expansion/contraction and control joints, and shall be supplied and installed at no additional cost.
- D. Reinforcing shall be continuous through construction joints of reinforced slabs, unless otherwise indicated on Drawings. Placement schedule shall be submitted for approval.
- E. For slabs-on-grade, no concrete pour shall be longer than 100 feet or more than 4,000 square feet in area, unless early entry saw-cutting techniques are utilized for placement of joints in the slab while the concrete is still in a green state and prior to the slab developing expansion/contraction cracking at random location. Provide shear keys as detailed.

- F. Provide support of formed construction joint materials by means that does not puncture or otherwise damage under floor vapor retarder at interior floor slabs on grade.

3.04 FINISHING VERTICAL (FORMED) SURFACES

- A. Formed surface finishes:
 - 1. Pits, tunnels, mechanical rooms and concealed surfaces: Remove fins, patch tie holes.
 - 2. Interior and exterior exposed surfaces: Remove fins, patch tie holes, stone joint marks, out-of-plane surfaces and other projections to produce uniform, smooth, dense concrete having the following formed finish Class and permitted abrupt or gradual irregularities as designated by ACI 347-04:
 - a. Vertical and horizontal exterior exposed surfaces: Class A Smooth Finish, 1/8 inch, except abrupt irregularities shall be removed.
 - b. Other surfaces prominently exposed to public view: Class A Smooth Finish, 1/8 inch, except abrupt irregularities shall be removed.
 - c. Concealed surfaces where covered by another finish: Class C, 1/2 inch, except abrupt irregularities shall be limited to 1/4 inch.

3.05 FINISHING HORIZONTAL SURFACES

- A. Rake concrete into place, screed and compact with a light tamp, except do not tamp topping and slabs not on grade. Screed with sawing motion and float surface to bring fines to the top.
- B. Mix and apply evaporation retarder in accordance with manufacturer's printed instructions immediately after floating. In extreme drying conditions, apply additional material as needed. Apply lightly on hard to trowel floor areas.
- C. When concrete has hardened sufficiently so that excess fines will not be brought to the surface, trowel slab with a steel trowel to a smooth surface free of pinholes and other imperfections. A mechanical trowel with rotating steel blades, approved by Architect, shall be used for this operation.
- D. After the surface has hardened sufficiently to ring under a trowel, trowel again with a steel trowel to a hard, burnished surface free of blemishes.
- E. Concrete slabs scheduled to receive ceramic or stone tile, concrete topping or similar finishes shall have a screeded finish but true and even to plane with no sharp projections or ridges.
- F. Use a 1/8 inch radius edger on edges of exposed Work. Use a deep cutting, 1/8 inch radius scoring tool or sawcutting to provide scoring for control joints as indicated unless otherwise noted or directed.
- G. Exterior flatwork and walks to receive medium broom finish, unless otherwise indicated on Drawings.
- H. Finish floors shall meet requirements of ACI 302.1R for a Flat (3/16 in 10'-0") Classification. Floors scheduled to receive thin-set tile applications shall meet Very Flat (1/8 inch in 10'-0") Classification.

3.06 SLABS

- A. Saw cut or score contraction joint pattern indicated on Drawings. Use thick blade or scoring tool. Early entry saw shall be used immediately after final finishing and to a depth of 1-1/4 inches. A conventional saw or scoring tool shall cut 1/4 of the depth of slab thickness.
- B. Slope to drains to drains as indicated on Drawings, but not less than 1/4 inch per foot nominal across entire room or area to be drained.

3.07 REPAIR OF SURFACE DEFECTS

- A. Modify or replace concrete not conforming to required lines, detail and elevations. Grind high spots and fill low areas as required to provide finished floor tolerances as required for application of finish floor materials.
- B. Repair or replace concrete not properly placed, resulting in excessive honeycombing and other defects. Do not patch, repair or replace exposed architectural concrete except upon express direction of Architect.
- C. After forms are removed, fill tie rod holes, correct honeycomb spots, remove fins and clean and finish damaged surfaces. Wipe off excess mortar and rub to match adjoining surfaces.
- D. When excessive honeycombing is revealed, remove the defective material immediately after stripping forms to a depth of 3/4 inch to 1 inch. Cut edge of area perpendicular to surface to avoid feathered edges. Repair using the following method or submit method of repair and patching material to Architect and Structural Engineer for approval.
 - 1. Saturate with water for several inches beyond cutout and brush-in a grout consisting of equal parts Portland cement and sand. Follow immediately with the patching mortar. Leave the patch slightly higher than the surrounding surface. After an hour or two, finish flush with the adjoining surface. Wipe and rub patch to match adjoining surfaces. Keep patches moist for 7 days.
 - 2. Patching mortar shall consist of the same materials and proportions as the original concrete except that the coarse aggregate shall be omitted. When color match is required, adjust mixture to produce a finished color to match the adjoining concrete surfaces.
- E. Cracks caused by expansion, shrinkage and the like that occur in natural color concrete up through final acceptance of building shall be carefully repaired by epoxy injection or other method approved by the Architect.

3.08 CURING

- A. Protect freshly deposited concrete from premature drying and maintain without drying at a relatively constant temperature for the period of time necessary for the hydration of the cement and proper hardening of the concrete.

- B. Curing Methods: Cure concrete surfaces receiving finish materials, including, but not limited to; cementitious toppings, paint, and flooring, using one of the following two methods immediately after finishing operations. Consideration shall be given to the construction schedule impact and the compatibility of finish materials with the concrete when selecting a method.
 - 1. Keep concrete continuously moist for at least 7 days using polyethylene film, liquid membrane forming curing compound, or other acceptable covering. Interior floor slabs on grade shall be continuously moist cured for a minimum of 7 days in accordance with ACI standards.
 - 2. Liquid curing compounds shall not be acceptable unless it has been demonstrated that curing compound can satisfactorily serve as a base for finish materials or removed, resulting in a satisfactory base for adhesion of finish materials.
 - 3. Where approved for use, apply liquid curing compound in accordance with the Manufacturer's printed instructions.
 - 4. Refer to Structural Drawings for other acceptable curing procedures.
- C. Prevent rapid drying of the concrete at the end of the curing period.
- D. During the curing period, protect the concrete from damaging mechanical disturbances, particularly load stresses, heavy shock, and excessive vibrations. Protect finished concrete surfaces from damage caused by construction equipment, materials or methods.

3.09 UNDERLAYMENT OR REPAIR TOPPING

- A. Apply underlayment or repair topping to correct unsatisfactory floor surface due to undue settlement or failure to meet tolerance requirements.
- B. Slab surface preparation and placing procedures shall be approved by the underlayment and/or repair topping manufacturer and Architect prior to start of installation.
- C. Installation: Install underlayment and/or repair topping materials in accordance with Manufacturer's published instructions and recommendations.

3.10 FLOOR SEALER

- A. All exposed flatwork concrete, at interior and exterior locations, shall be sealed with 2 coats of sealer.
- B. Surface must be clean, dry and free of loose dirt, oil, wax, curing and parting compounds and other foreign matter.
- C. Apply each coat in accordance with Manufacturer's printed instructions.

3.11 FIELD QUALITY CONTROL

- A. Tests: Inspection and testing of concrete mix will be performed by a testing laboratory in accordance with Section 01 45 00.
 - 1. Provide free access to Work and cooperate with appointed firm.
 - 2. Tests of cement and aggregates may be performed to ensure conformance with specified requirements.
 - 3. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.

4. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231, pressure method for normal weight concrete; one for each day's pour of each type of air-entrained concrete.
 5. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4 deg C) and below, when 80 deg F (27 deg C) and above, and one test for each set of compressive-strength specimens.
 6. Compression Test Specimen: ASTM C 31; one set of four standard cylinders for each compressive-strength test, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens except when field-cured test specimens are required.
 7. Compressive-Strength Tests: ASTM C 39; one set for each day's pour exceeding 5 cu. yd. plus additional sets for each 50 cu. yd. more than the first 25 cu. yd. of each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.
 8. Take one additional test cylinder during cold weather concreting, and cure on job site under same conditions as concrete it represents.
 9. Slump: ASTM C 143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed. .
 10. Concrete which does not meet the compressive strength requirement at 28 days will be rejected and removed from the Project, and disposed of in a legal manner.
- B. Calcium chloride test requirements:
1. Two weeks before installation of the ceramic tile, VCT, vinyl, wood, carpet, epoxy flooring and/or other finish flooring systems over the interior concrete slabs, provide calcium chloride test to determine the level of water vapor transmission in the slab.
 2. Conduct testing in accordance with ASTM F1869 or ASTM E1907 (quantitative anhydrous calcium chloride test).
 3. Conduct calcium chloride tests after HVAC system has been in continuous use for 36 hours with a minimum ambient temperature of 72 degrees F. Water vapor transmission levels are directly affected by ambient room temperature and readings conducted without a sustained ambient temperature is NOT acceptable.
 4. Document test results and provide copy to Architect with a marked up floor finish plan showing test results.
 5. Provide a written clarification on status of HVAC system before and during the test and the length of time the ambient air temperature was maintained before the tests.

3.12 PROTECTION

- A. Protect finished surfaces from stains or abrasions. Protect surfaces or edges by leaving forms in place or by providing temporary covers. Protect concrete from rain, flowing water or mechanical injury.
- B. Protect floor slabs from the droppings of plaster, paint, dirt, and other marring by covering with polyethylene plastic sheet, or other acceptable floor protection covering, well lapped and sealed.
1. Where concrete slabs are scheduled to be the finished floor surface, or where slab is treated with a special concrete finish serving as the finished floor surface, provide a continuous covering of 1/2 inch particle board, joints tightly butted and cut to sizes tight to wall construction, over entire floor area over polyethylene plastic sheet, or other acceptable floor protection sheeting. Maintain covering (polyethylene and particleboard) in good condition until danger of damage is past.

3.13 CLEANING

- A. During the course of the Work and on completion of the Work, remove and dispose of excess materials, equipment and debris away from premises.

END OF SECTION

SECTION 04 05 15

MORTAR AND MASONRY GROUT

PART 1 GENERAL

1.01 SUBMITTALS

- A. Mix Designs:
 - 1. Submit mix designs and samples to the Architect for review prior to delivering materials to the site or commencing the Work.
 - a. Mortar Mix Design: Furnish in accordance with ASTM C270.
 - b. Grout Mix Design: Furnished by either the grout supplier or an independent testing laboratory. Submit comprehensive strength data with mix design submittals when pozzolans are used.
- B. Product Data: If alternative mortar materials are to be provided, submit current instructions stating the actual quantities and mixing instructions for alternative mortar materials to conform to specified requirements.
 - 1. Submit test report data substantiating compliance with specified performance requirements.
 - 2. Submit current ICC Evaluation Report.

1.02 DELIVERY, STORAGE, AND HANDLING

- A. Storage and Protection: Cementitious materials shall be stored off the ground, under cover and shall be kept dry.
- B. Preblended Mortar Mix Delivery System: The use of dry preblended mortar silos and bulk bags shall be acceptable. Bulk bags and silos shall be sealed to prohibit contamination of the ingredients and to keep the materials dry until mixed.

1.03 PROJECT/SITE CONDITIONS

- A. Environmental Requirements:
 - 1. Hot Weather Requirements: Wet mortar board before loading and cover mortar to retard drying when not being used.
 - 2. Cold Weather Requirements: In accordance with "Recommended Practices and Guide Specifications for Cold Weather Masonry Construction" by IMIAC; provide adequate equipment for heating the mortar and grout materials, when air temperature is below 40 degrees F.. Temperatures of the separate materials, including water, shall not exceed 140 degrees F. when placed in the mixer. When air temperature is below 32 degrees F., maintain mortar temperature on boards above freezing.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Mortar:
 - 1. Cement: Type II Portland cement conforming to ASTM C150.
 - 2. Aggregate: Clean, sharp and well graded and free from injurious amounts of dust, lumps, shale, alkali, surface coatings and organic matter, conforming to ASTM C144, except that no less than 3 percent nor more than 10 percent shall pass a No. 100 sieve.

3. Hydrated Lime: ASTM C207, Type S.
4. Water: Clean and potable.
5. Admixtures:
 - a. Chemical: The use of accelerator admixtures, water reducing plasticizers and other chemical admixtures shall not be allowed.
 - b. Mineral: In accordance with Section 03 05 05.
 - c. Alternative Plasticizer: Pozzolanic formulation consisting of a combination of hydroxy aluminum silicates and diatomite:
 - 1) Alternative Plasticizer Manufacturer: Engaged in producing materials with a satisfactory performance record for at least 5 years.
 - 2) Mortar mix design shall be in accordance with ICC Evaluation Report, in accordance with the mortar type specified elsewhere in this specification.
 - 3) Provide alternative plasticizer in accordance with manufacturer's printed instructions, including specific mixing instruction.
 - 4) No other admixtures shall be used in conjunction with the alternative plasticizer unless approved in writing by the alternative plasticizer manufacturer.
 - 5) Packing and Shipping: Mortar admixture(s) shall be delivered to the job site in manufacturer's original containers with seals unbroken and labeled with manufacturer's batch number.

- B. Grout:
1. Cement: Type II Portland cement conforming to ASTM C150.
 2. Aggregate: ASTM C404 and as follows:
 - a. Sand: Size No. 1 for fine aggregate.
 - b. Pea Gravel: Size No. 8 for coarse aggregate.
 3. Water: Clean and potable.

2.02 MIXES

- A. Mortar: ASTM C 270, Type S.
1. Measurement: Accurately measure materials by ASTM C270 by the Property Method per Table 2.
 2. Mix cementitious materials and aggregates 3 to 5 minutes in a mechanical mixer. Small amounts of mortar may be mixed by hand. Adjust consistency of the mortar depending on the absorptive quality of the units being laid, and to the satisfaction of the mason.
 3. If mortar begins to stiffen, it may be retempered by adding water within a basin formed by the mortar, and remixing.
 4. Use within 2-1/2 hours of initial mixing and no mortar shall be used after it has begun to set or after it has become harsh or non-plastic.
 5. Preblended Mortar Mix: Provide mortar as specified herein, except that dry ingredients may be preblended and bulk packaged for delivery to a jobsite silo (which loads into batch mixer) or bagged for hand loading into mixer. Moisture shall be extracted from sands. Digital printouts displaying the proportions of each batch shall be submitted to the Architect upon request. Mixing shall be accomplished by mechanical mixer in accordance with instructions provided by Preblended Mortar Mix Distributor.

- B. Grout:
 - 1. Job-Site Mixed: In accordance with ASTM C476.
 - 2. Transit-Mixed:
 - a. Designed by the supplier or an independent testing laboratory with a minimum compressive strength of 2000 psi (140mPa) in 28 days, unless higher strength is required by the Structural Drawings and Notes.
 - b. Slump: Not to exceed 8 inches, unless otherwise noted on Drawings.
 - c. Use within 1-1/2 hours of initial mixing and use no grout after it has begun to set or after it has become harsh or non-plastic.
 - d. Course grout may be used in cavity walls with a horizontal dimension of 2 inches or more, and in hollow cell construction 4 inches or more in both horizontal directions.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Installation of mortar and grout shall be as specified under each of the following Sections and in accordance with AMG Standard 108:
 - 1. Section 04 22 00 – Concrete Unit Masonry
- B. Temperature: Mortar and grout shall have a temperature between 50 degrees F. and 90 degrees F. while being used.
- C. Grout may be poured by hand bucket, concrete hopper or through a grout pump. Grout spaces shall not be wet down prior to pouring grout.

3.02 FIELD QUALITY CONTROL

- A. General: Tests and inspections as necessary to verify quality and strength of mortar and grout. Laboratory tests shall conform to applicable ASTM standards and tests.
- B. Tests:
 - 1. Frequency: As determined by the Architect based upon total time for construction of masonry with not less than two tests per each level of masonry construction, foundation to roof or floors.
 - 2. Testing Laboratory: Inspection and testing of mortar and grout will be performed by a testing laboratory in accordance with Section 01 45 00. The testing laboratory, in addition to meeting requirements of ASTM E329, must be an approved laboratory competent to perform cement physical testing.
 - 3. Distribution of Results of Tests: Within 24 hours of results of tests, copies of the results shall be submitted to the Architect, Contractor, masonry contractor, and the grout supplier if applicable.
- C. Mortar:
 - 1. Property Specification (ASTM C270): Testing in accordance with ASTM C 780.
 - 2. For determining hardened mortar properties, prepare 3 test specimens for each test age and property. A strength test shall be the average of the strengths of the specimens tested at the age specified. Specimens shall be tested at 7 and 28 days.

- D. Grout:
1. Testing per ASTM C1019.
 2. Three test specimens shall constitute one sample. A strength test shall be the average of the strengths of the specimen tested at the age specified.
 3. Specimens shall be tested at 7 and 28 days.
 4. The compression strength will be considered satisfactory if the average of three consecutive tests of the grout is equal to or greater than the specified strength and no individual strength test falls below the specified strength by more than 500 psi.

3.03 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises.

END OF SECTION

SECTION 04 05 23

MASONRY ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Furnishing the following items for installation under Section 04 42 00:
 - 1. Ties/Anchors.
 - 2. Through wall flashings.
 - 3. Weep holes.
 - 4. Weep/Vent and Cavity Drainage Material.

1.02 SUBMITTALS

- A. Product Data: Submit Manufacturer's brochures depicting each of the masonry accessories which will be used prior to delivering materials to the site or commencing the Work in this Section.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Storage and Protection: Store metal items at the site off the ground and in a manner to prevent damage to the materials.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the following Manufacturers, subject to compliance with Specification requirements.
 - 1. Dur-O-Wall Inc. www.dur-o-wal.com
 - 2. Heckmann Building Products, Inc. www.heckmannbuildingprods.com
 - 3. Hohmann and Barnard, Inc. www.h-b.com

2.02 MATERIALS

- A. Steel Wire: ASTM A82, diameter as specified for accessory.
- B. Flat and Corrugated Sheet Steel: ASTM A653 or ASTM A568.
- C. Galvanized Finish: ASTM A641, Class 1, mill galvanized for interior walls, or ASTM A153, Class B-2, hot dip galvanized for exterior walls.

2.03 ACCESSORIES

- A. General: Anchors and ties shall be steel with zinc coated finish or shall be of other non-corrosive metal.
- B. Adjustable Veneer Anchors (Facing over Framing): Dur-O-Wal D/A 213, Heckman 315-D with 316, or Hohmann & Barnard DW-10 complying with IBC 2006, Section 1405.
 - 1. 3/16 inch diameter steel wire of approved shape, machine fabricated, designed to be screw fastened.

2. Provide 2 piece "Rectangular" or "Triangular" strut, compression and tension, eye and pin tie with sheet metal anchor section with screw holes top and bottom and with raised rib stiffened strap stamped into center for attachment of wire tie section.
 3. Screws shall have a copolymer corrosion resistant coating or be Type 304 stainless steel, suitable for attachment of veneer anchors, length as required.
- C. Joint Reinforcing: Joint reinforcing shall be in accordance with requirements of IBC 2006, Section 1405, and the Structural Drawings.
- D. Joint Filler: Closed cell neoprene rubber conforming to ASTM D1056, Grade 2A1, oversized 50 percent, self expanding, 2-3/4 or 3 inch width by maximum length.
- E. Through-Wall Flashing:
1. Granular surfaced Self-adhering, flexible flashing consisting of pliable and highly adhesive rubberized asphalt compound overall 60 mil thickness; protected from contamination from dust or dirt by a silicone-coated release sheet, to be removed immediately before installation.
 2. Grace Perm-A Barrier as manufactured by W.R. Grace & Co, or equivalent as approved by Architect.
 3. Provide wall flashing accessories (surface conditioner, termination mastic) as required to provide a complete installation.
- F. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, full height and width of head joint and depth 1/8 inch less than depth of outer wythe; in color selected from manufacturer's standard.
1. Available Products:
 - a. Mortar Net USA, Ltd.; Mortar Net Weep Vents.
- G. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
1. Provide one of the following configurations:
 - a. Strips, full-depth of cavity and 10 inches wide, with dovetail shaped notches 7 inches deep that prevent mesh from being clogged with mortar droppings.
 2. Available Products:
 - a. Mortar Net USA, Ltd.; Mortar Net.

PART 3 EXECUTION

3.01 INSTALLATION

- A. General: Installation of masonry accessories shall be as specified under each of the following Sections and in accordance with AMG Standard 108.
1. Section 04 42 00 – Concrete Unit Masonry.
- B. Through Wall Flashing:
1. Provide through-wall flashings as indicated on Drawings and in accordance with the requirements of Specification Section for the masonry units.
 2. Specified flashing and accessories are not designed for use as a finished surface or for use in areas where they will be exposed to sunlight. Prevent contact with products containing fresh coal tar or coal tar pitch. Prevent contact with sealant products containing polysulfide polymers due to incompatibility.
 3. Remove deleterious materials from surfaces to be flashed.

4. Apply surface conditioner by spray, brush or roller at the rate recommended by manufacturer to dirty or dusty surfaces or surfaces having an irregular or rough texture before installing flashing membrane.
 5. Remove silicone-coated release paper and position flashing carefully before placing it against the surface. When properly positioned, place against surface by pressing firmly into place by hand roller or blunt object, such as the backside of a utility knife. Fully adhere flashing to substrate to prevent water from migrating under flashing.
 6. Overlap adjacent pieces 2 inches and roll overlaps with a steel hand roller or a blunt object. Fully seal overlaps to prevent water leakage through laps. Trim bottom edge 1/2 inch back from exposed face of the building.
 7. At heads and sill where flashing is indicated to be placed, turn up ends a minimum of 2 inches and make careful folds to form a pan, with the pan seams sealed with compatible mastic acceptable to flashing manufacturer.
 8. Apply a bead or trowel coat of compatible mastic acceptable to flashing manufacturer along top edge, seams, cuts and penetrations. Seal penetrations through flashing with compatible mastic acceptable to flashing manufacturer.
- D. Mesh Weep/Vent and Cavity Drainage Material: Install vents and cavity drainage materials in accordance with manufacturer's instructions.

3.02 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises.

END OF SECTION

SECTION 04 22 00

CONCRETE UNIT MASONRY

PART 1 GENERAL

1.01 SUBMITTALS

- A. Samples: Submit samples to Architect for review prior to delivering materials to Site or commencing Work in this Section.
 - 1. Provide 2 samples of each type and weight classification of concrete masonry units, (stretcher units), to be used on Project showing range of texture and/or color variations of exposed surfaces for units.
 - 2. Units provided to Project shall match these samples.
- B. Shop Drawings: Submit Shop Drawings showing proposed location of control joints and obtain approval of same from Architect and Structural Engineer prior to construction.
- C. Certificates: Submit certification to the Architect prior to delivery of concrete masonry units to jobsite, signed by Concrete Masonry Unit Manufacturer, stating that the concrete masonry units to be supplied: 1) shall meet the specified requirements for concrete masonry units for exterior building wall construction, and; 2) are suitable for proposed usage.
- D. Test Reports:
 - 1. Submit test results for concrete masonry units for exterior building wall construction to be used to Architect in accordance with Section 01 45 00.
 - 2. Test results shall clearly indicate:
 - a. Types of materials and composition.
 - b. Classification of concrete masonry unit in accordance with ASTM C90 requirements.
 - c. Water penetration and leakage in accordance with testing specified under Source Quality Control specified in this section.
 - 3. Testing laboratory shall notify Architect of non-conforming material submittals.

1.02 QUALITY ASSURANCE

- A. Standards:
 - 1. The "Levels of Quality", Standard 107 of Arizona Masonry Guild (AMG) shall apply and by reference is hereby made a part of this Specification. Reference to Custom, Standard or Economy in this Specification shall be as defined in latest edition of AMG Standard 107.
 - 2. Comply with the requirements of ACI 530.1/ASCE 6 "Specifications for Masonry Structures", except as otherwise indicated.
- B. Regulatory Requirements: Masonry materials and workmanship shall meet requirements of building codes which are applicable to jurisdiction in which Project is located.
- C. Certifications: Concrete masonry units shall be supplied by a manufacturer participating in the Certified Block Program of the Arizona Masonry Guild.
- D. Installer Qualifications: The Masonry Subcontractor shall have a supervisor on the jobsite, whenever masonry work is being performed, who is Certified by the Arizona Masonry Contractors Association. Proof of certification shall be submitted to the Architect prior to start of masonry work.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Transport and handle masonry units in such a manner as to prevent chipping and breakage.
- B. Deliver and store materials in dry, protected areas.
- C. Keep free of stain or other damage.
- D. Locate storage piles, pallets, stacks or bins to avoid or protect material from heavy or unnecessary traffic.
- E. Replace damaged material at no cost to Owner.

1.04 PROJECT/SITE CONDITIONS

- A. Hot Weather Requirements:
 - 1. When ambient air temperature exceeds 100 degrees F., or when ambient air temperature exceeds 90 degrees F. and wind velocity is greater than 8 mph, Masonry Contractor shall implement hot weather protection procedures as submitted to Architect.
 - 2. Do not spread mortar beds more than 4 feet ahead of placing block units.
 - 3. Place block units within one minute of spreading mortar.
- B. Cold Weather Requirements:
 - 1. Fully protect concrete masonry units against freezing by a weather-tight covering which shall also prevent accumulation of ice.
 - 2. Do not lay concrete masonry units when temperature of surrounding atmosphere is below 40 degrees F. or is likely to fall below 40 degrees F. in the 24 hour period after laying, unless adequate protection is provided.

1.05 SCHEDULING AND SEQUENCING

- A. Coordination: Coordinate with other Trades whose Work relates to concrete masonry unit installation for placing required blocking, backing, furring, conduits and other items.

PART 2 PRODUCTS

2.01 MATERIALS

- A. General Requirements for Concrete Masonry Units:
 - 1. Concrete masonry units shall meet ASTM C90 requirements except that when CMU will be exposed in final construction, ASTM C90-00, paragraph 7.2.1 shall be modified to read: "Three percent of a shipment containing chips not larger than 1/2 inch in any dimension, or cracks not wider than 0.02 in. and not longer than 10% of the nominal height of the unit is permitted." Linear shrinkage of units of units shall not exceed 0.065 percent.
 - 2. Units shall be in the same condition in wall as they were upon delivery.
 - 3. Unit sizes shall be 8 by 8 by 16 inches, 4 by 8 by 16 inches, and as otherwise indicated on Drawings.
 - 4. Texture and color shall be consistent for all units provided for exposed walls. Range of texture and color shall be within that shown by samples reviewed by Architect.
 - 5. Surface of units shall be clean and free from dirt when laid in walls.

6. Units not complying with the appropriate ASTM Standards and AMG Standard 107 shall not be laid in the wall where exposed to view. Any unit that is chipped in excess of the requirements of AMG Standard 107 will be rejected and shall be removed and replaced.
 7. Provide special block sizes and shapes required or as shown on Drawings.
 8. CMU may be used for construction of building walls exposed to the exterior if they comply with requirements specified under Source Quality Control.
- B. Hollow CMU Classifications: The following requirements shall apply to all shapes, colors, textures and sizes of CMU provided.
1. Lightweight units: Weighing less than 105 lbs. per cubic foot and manufactured from volcanic scoria aggregate per ASTM C331.
 2. Medium weight units: Weighing 105 lbs. per cubic foot to less than 125 lbs. per cubic foot and manufactured from a combination of volcanic scoria aggregate conforming to ASTM C331 and sand conforming to ASTM C33.
- C. Standard Smooth Faced CMU: Manufacturer's standard smooth faced units.
- D. Split Faced CMU:
1. Units shall be 8 x 8 x 16 inches or as shown on Drawings with some variation allowed in width and length due to splitting.
 2. Furnish units split on 1, 2 or 3 faces as required by the design.
- E. Accessory Units: Provide units as required for window sills and jambs, doors, control joints, bond beams, lintels, pilaster, caps and other locations as indicated on Drawings with a minimum of block cutting. Accessory units shall match adjacent unit color and texture unless noted otherwise.

2.02 ACCESSORIES

- A. Joint Reinforcing: Joint reinforcing in accordance with requirements of IBC 2006, Chapter 21.
- B. Reinforcing Steel: As specified under Section 03 20 00.
- C. Wall Ties, Through-Wall Flashings, Weep Holes, and Mesh Weep/Vent and Cavity Drainage Material: See Section 04 05 23.
- D. Control Joints:
1. Rubber: Extruded, solid section, ASTM D2000 2AA-805 with a durometer hardness of 70 or 80 when tested per ASTM D2240.
 2. Polyvinyl Chloride (PVC): ASTM D2287, Type PVC 654-4 with a durometer hardness of 85 (+5) when tested per ASTM D2240, minimum tensile strength of 1750 psi with minimum 300 percent elongation per ASTM D638, and cold crack brittleness of 50 degrees F per ASTM D746.
 3. Sizes and Profiles: As indicated on Drawings.
- E. Mortar and Grout: As specified under Section 04 05 15.
- F. Sheet Metal Flashings: See Section 07 60 00. Furnish shapes in accordance with project requirements and NCMA TEK 19-2A, 19-4A and 19-5A.
- G. Steel Lintels: As indicated or scheduled on Structural Drawings.

2.03 SOURCE QUALITY CONTROL

- A. Concrete masonry units to be provided for exterior exposed building wall construction shall be tested by manufacturer using a spray bar test as follows:
1. Testing shall be performed at no additional cost to Owner.
 2. Individual concrete masonry units shall be placed on a rack where water is sprayed at a rate of 140 gallons per hour for a minimum of 4 hours.
 3. Testing shall be made upon concrete masonry units prior to application of post-applied water repellent.
 4. Test results for units regularly manufactured using a standard mix design within the previous 6 months shall be acceptable.
 5. Test results shall meet or exceed the following:

Location	Results
Inside front face shell	<20% damp (no running water or sheen)
Center web	Dry
Inside outer web	<10% damp
Inside of back face shell	Dry
Outside of back face shell	Dry

6. Submit test reports as specified herein under "Submittals."

PART 3 EXECUTION

3.01 EXAMINATION

- A. Installer shall examine supporting structure and conditions under which unit masonry is to be installed, and notify Contractor, in writing, conditions detrimental to proper and timely completion of Work. Do not proceed with the installation of unit masonry Work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.
- B. Do not use units with chips, cracks, or other defects which might be visible in the finished Work unless otherwise acceptable to the Architect.
- C. Do not build on frozen Work; remove and replace unit masonry Work damaged by frost or freezing.
- D. Do not use frozen materials or materials mixed or coated with ice or frost. Do not lower freezing point of mortar by use of admixtures or anti-freeze agents, and do not use calcium chloride in mortar or grout.

3.02 PREPARATION

- A. Protection: Protect sills, ledges, offsets and other projections from dropping of mortar and grout.

3.03 ERECTION, INSTALLATION, APPLICATION

- A. General Requirements for Concrete Masonry Walls:
1. Workmanship:
 - a. Provide Standard Level workmanship as defined by AMG Standard 107.

- b. Concrete masonry units which will be exposed in the finished work shall be treated as an architectural finish and shall be handled carefully to ensure that chippages do not occur during handling and laying. Handling shall be minimized on the jobsite to eliminate chances for chippage.
 2. Lay units in uniform and true courses, level and plumb to height indicated on Drawings.
 3. Lay concrete unit masonry in such a way that cracks are not formed at time unit is placed in wall.
 4. Units shall not be wetted before being used and shall be laid dry.
 5. Adjusting Units:
 - a. Units shall be adjusted to be level, plumb and straightened into final position in wall while mortar is still soft and plastic enough to ensure a good bond.
 - b. Avoid over-plumbing and pounding of corners and jambs to fit stretcher units after they are set in position.
 - c. If position of unit is shifted after mortar has stiffened, or bond is broken or cracks are formed, re-lay unit in new mortar.
 6. Bearings on Walls: Provide 3 courses of solid units or grouted hollow masonry units below steel bearing plates or beams bearing on walls. Extend bearings each side of contact with load as required to properly transfer loads into wall.
 7. Openings: Provide openings in masonry walls where required or indicated. Steel lintels shall be provided unless otherwise noted.
 8. Cutting of masonry: When required, exposed block units shall be cut with a power driven Carborundum or diamond disc blade saw. When using "wet" cutting methods, clean water shall be used on exposed units.
 9. Anchor masonry units facing against or abutting concrete members to concrete by use of dovetailed flat bar anchors inserted in slots built into concrete.
 - a. Space anchors not more than 16 inches vertically and 24 inches horizontally.
 - b. Maintain a space not less than 1/2 inch width between masonry and concrete members, keeping space free of mortar or other rigid materials so as to permit differential movement.
- B. Anchorage of Concrete Masonry Unit Veneer:
1. Steel Stud Framed Walls: Anchor veneer with adjustable ties or anchors spaced so as to support not less than 2 square feet of wall area, but not more than 16 inches vertically and 24 inches horizontally with additional ties within 12 inches of openings and spaced not more than 12 inches around perimeter of openings.
 - a. Locate anchor section relative to course where tie section is embedded to allow maximum vertical differential movement of tie up and down.
 - b. Fasten ties through sheathing to wall framing with two corrosion resistant coated screws.
- C. Bonding:
1. Bond pattern shall be regular running bond unless indicated otherwise on the drawings.
 2. Bond shall be plumb throughout face of wall.
- D. Bearing Wall Intersections:
1. Intersecting block bearing walls shall not be tied together in a masonry bond, except at corners.
 2. One wall shall terminate at face of other wall with a control joint at intersection.
 3. Tie intersecting wall together with a metal tie bar, 1/4 inch x 1-1/4 inches x 2'-4" long with a 2 inch right angle bend at each end of bar, spaced vertically at 2 feet on center.
 4. Bends at ends of tie bars shall be embedded in grouted cells.

5. Rake out vertical joint between intersecting walls to a depth of 3/4 inch after mortar has stiffened.
 6. Provide sealing of control joint as specified in Section 07 92 00.
- E. Non-Bearing Wall Intersections:
1. Tie non-bearing wall together with strips of metal lath or galvanized 1/4 inch mesh hardware cloth placed across joint between 2 walls placed in alternate horizontal block courses.
 2. Rake out vertical joint between intersecting walls to a depth of 3/4 inch after mortar has stiffened.
 3. Provide sealing of control joint as specified in Section 07 92 00.
- F. Joining of Work:
1. Where fresh masonry joins partially set masonry the exposed surface of the set masonry shall be cleaned and lightly wetted so as to obtain the best possible bond.
 2. Remove loose concrete block and mortar.
 3. Stop-off a horizontal run of masonry by racking back 1/2 brick length in each course and, if grout is used, stopping the grout 4 inches back of the rack.
 4. Toothing will not be permitted, except upon written approval of the Architect.
- G. Mortar Joints:
1. Joints shall be straight, clean and a uniform 3/8 inch thickness on exposed wall face and in accordance with NCMA TEK 19-2A.
 2. Exposed vertical and horizontal joints shall be tooled when mortar is "thumbprint" hard with round or other approved jointer, slightly larger than the width of the joints to produce a dense, slightly concave tooled surface which is well bonded to block at edges.
 3. Joints shall be tooled flush at:
 - a. Interior or exterior surfaces to receive stucco, furred wall construction, or other finishes requiring flush joints that are to be concealed.
 4. Solidly fill joints from face of unit to depth of face shell, except where specified otherwise.
 5. Full bedding to be provided for first course on foundation and wherever maximum strength is required.
 6. Butter vertical head joints well and shove these joints tight so that mortar bonds well to both units.
 7. Full coverage to be provided on bed of face shells and webs surrounding cells to be filled.
 8. Bee-holes or other open joints shall be filled and tooled with mortar while mortar is still fresh.
- H. Control Joints:
1. Provide control joints, as detailed, at vertical masonry walls where such walls exceed 40 feet in length. In long length of walls, provide joints at approximately 24 feet on center or as detailed.
 2. Control joints shall be continuous full height of walls.
 3. At bond beams, control joints shall separate both block and grout; however, steel reinforcing shall be continuous.
 4. Horizontal wire reinforcing shall not run through control joint.
 5. Control joints shall not occur at wall corners, intersections, ends, within 24 inches of concentrated points of bearing or jambs or over openings unless specifically indicated on Structural Drawings.
 6. Control joint materials shall be held back from finished surface as required to allow for sealant and back-up materials.

- I. Horizontal Joint Reinforcing:
 - 1. Place horizontal joint reinforcing every 16 inches vertically throughout wall construction.
 - 2. Continuously reinforce first bed joint immediately above and below openings. Provide reinforcing in second bed joint above and below openings which extends 2 feet beyond each side of opening.
 - 3. Lap splices in reinforcing in accordance with Structural Drawings.
 - 4. Cut and bend reinforcing at corners.
- J. Vertical Reinforcing and Bond Beam Reinforcing:
 - 1. Place in accordance with requirements of Drawings.
 - 2. Vertical Reinforcement: Provide continuous reinforcing full height of wall at wall ends, corners, intersections, jambs of openings and each side of control joints. Vertical reinforcing shall match and lap dowels which are at top of foundation walls and precast concrete beams.
 - 3. Bond Beams: Provide horizontal reinforcing of 2 bars in minimum 8 inch deep grouted continuous bond beam at roof and elevated floor lines.
 - 4. Parapets: Provide horizontal reinforcing of 1 bar in minimum 8 inch deep grouted continuous bond beam at top of parapets.
 - 5. Bond Beam and Parapet Reinforcing at Vertical Control Joints: Place bars continuous through control joint and wrap mastic tape around bars for 18 inches each side of control joint.
 - 6. Bond Beam and Parapet Reinforcing at Corners and Wall Intersections: Provide bent bars to match reinforcing at corners and wall intersections.
 - 7. Lap splices in reinforcing in accordance with Structural Drawings.
 - 8. Use spacers to position reinforcing steel in center of grout at center of wall as required by code.
- K. Grouting:
 - 1. Reinforcing steel is to be in place and inspected before grouting starts.
 - 2. Vertical cells to be filled shall have vertical alignment to maintain a continuous cell area.
 - 3. Keep cell to be grouted free from mortar.
 - 4. Fill cells solidly with grout in lifts not to exceed 5 feet.
 - 5. Grout may be poured by hand bucket, concrete hopper or through a grout pump.
 - 6. Do not wet down grout space prior to pouring of grout.
 - 7. Stop pours 1-1/2 inches below top of cell to form a key at pour points.
 - 8. Grout shall be consolidated by mechanical vibration during placing before loss of plasticity in a manner to fill grout space. Grout pours greater than 12 inches shall be reconsolidated by mechanical vibration to minimize voids due to water loss. Grout pours 12 inches or less in height shall be mechanically vibrated, or rodded.
 - 9. Grout barrier below bond beams shall be continuous wire lath or other approved material.
 - 10. Grout beams over openings and bond beams in a continuous operation.
 - 11. Solidly grout in place bolts, anchors and other items within wall construction.
 - 12. Fully grout jambs and head of metal door frames connected to masonry. Filling of frames shall be done as each 2 feet of masonry is laid.
 - 13. Use extreme care to prevent grout or mortar from staining face of the masonry.
 - 14. Immediately remove grout or mortar which is visible on face of masonry.
- L. Provisions for Other Trades and Built-in Items:
 - 1. Build in items required and indicated, including; but not limited to, reinforcing steel, anchors, flashings, sleeves, frames, structural steel, loose lintels, anchor bolts, nailing blocks, door and window frames and miscellaneous iron.

2. Enclosures for pipes, stacks, ducts and conduits:
 - a. Construct slots, chases, cavities, and similar spaces as required.
 - b. Where masonry is to enclose conduit or piping, bring it to proper level indicated and as directed.
 - c. Cover no pipe, conduit chases or enclosures until advised that Work has been inspected and approved.

M. Tolerances; Standard Level of Quality: In accordance with AMG Standard 107.

N. Joint and Crack Control: In accordance with NCMA TEK 10-1.

O. Flashing: In accordance with NCMA TEK 19-2A, 19-4A and 19-5A and 19-4.

P. Weep holes shall be provided above lintels and vertical obstructions as per manufacturer's flashing and weep hole diagrams.

3.04 FIELD QUALITY CONTROL

- A. Masonry Tests: Inspection and testing of masonry will be performed by a testing laboratory in accordance with Section 01 45 00.
1. Provide free access to Work and cooperate with appointed firm.

3.05 ADJUSTING

- A. Pointing of Mortar Joints:
1. Point and fill holes and cracks in exposed mortar joints.
 2. Cut out defective mortar joints to a depth of at least 1/4 inch.
 3. When cutting is complete, remove dust and loose material by brushing or vacuuming.
 4. Prehydrate mortar for pointing by mixing dry ingredients with only sufficient water to produce a damp mass of such consistency that it will retain its form when it is pressed into a ball with hands, but will not flow under trowel.
 5. Allow mortar to stand for a period of not less than one hour nor more than 2 hours, after which remix with addition of sufficient water to produce satisfactory workability.
 6. Pointing mortars shall be identical to adjacent mortar in similar joints and finish results shall match and be indistinguishable from original mortar used.
 7. Premoisten joint and apply mortar tightly.
 8. Tool to match adjacent joints.
 9. Moist cure for 72 hours.
- B. Patching: If approved by Architect, patching of exposed masonry walls shall be done at conclusion of general Work and shall conform as closely as possible to similar surrounding or adjoining Work.

3.06 CLEANING

- A. Daily Cleaning:
1. Keep walls clean.
 2. Masonry which is soiled from mortar and grout spills, or other dirt, splatters or debris, which will be exposed to view at completion of Project shall be cleaned immediately with stiff fiber brushes until wall is free of dropped or spattered mortar.
 3. Do not clean walls by sand blasting or high-pressure power washing.

- B. Walls indicated to be painted shall be cleaned with stiff fiber brushes until wall is free of all surface free of all dropped and splattered mortar and irregular surfaces that would telegraph through the painted finish or interfere with paint adhesion.
- C. Remove scaffolding and equipment used in Work.
- D. Clean up debris, refuse and surplus material and remove from premises.

3.07 PROTECTION

- A. Furnish temporary protection for exposed masonry corners subject to injury.
- B. Carefully cover tops of walls left incomplete at conclusion of day's Work with tarpaulins or other approved covering.
- C. In hot and dry weather, protect masonry against too rapid drying.
- D. Protect finished Work against freezing for a period of not less than 48 hours by means of enclosures, artificial heat, or such other protective methods as may be required.

END OF SECTION

SECTION 04 23 00

GLASS UNIT MASONRY

PART 1 GENERAL

1.01 SUBMITTALS

- A. Submit manufacturer's product and installation data.
- B. Submit samples to the Architect for review prior to constructing job-site mock-ups, delivering materials or commencing the Work. Provide 2 samples of glass unit masonry, showing type, pattern and color, to be used on the Project. Units shall match these samples.

1.02 QUALITY ASSURANCE

- A. Standards: The "Levels of Quality", Standard 107 of the Arizona Masonry Guild shall apply and by reference are hereby made a part of this Specification. References to Custom, Standard or Economy in this Specification shall be as defined in the latest edition of AMG Standard 107.
- B. Regulatory Requirements: Glass unit masonry materials and workmanship shall meet the requirements of the building codes which are applicable to the jurisdiction in which the Project is located.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Transport and handle masonry units in such a manner as to prevent chipping and breakage, soiling or other damage.
- B. Deliver and store materials in dry, protected areas.
- C. Comply with manufacturer's recommendation for transport and handling of glass units.
- D. Store glass unit masonry on wood skids or pallets, covered with non-staining, waterproof membrane and protected from weather and traffic.
- E. Replace damaged material at no cost to Owner.

1.04 PROJECT/SITE CONDITIONS

- A. Hot Weather Requirements:
 - 1. When the ambient air temperature exceeds 100 degrees F., or when the ambient air temperature exceeds 90 degrees and the wind velocity is greater than 8 mph, the Masonry Contractor shall implement hot weather protection procedures as submitted to the Architect.
 - 2. Do not spread mortar beds more than 4 feet ahead of placing block units.
 - 3. Place glass block units within one minute of spreading mortar.

- B. Cold Weather Requirements:
 - 1. Fully protect glass unit masonry units against freezing by a weather-tight covering which shall also prevent accumulation of ice.
 - 2. Do not lay glass unit masonry units when the temperature of the surrounding atmosphere is below 40 degrees F. or is likely to fall below 40 degrees F. in the 24 hour period after laying, unless adequate protection is provided.

1.05 SCHEDULING AND SEQUENCING

- A. Coordination: Coordinate with other Work relating to glass unit masonry installation for placing required blocking, backing, openings, sealant, and other items.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the following Manufacturers, subject to compliance with Specification requirements.
 - 1. Pittsburgh Corning Glass Block www.pittsburghcorning.com
 - 2. As approved by Architect.

2.02 MATERIALS

- A. Glass Masonry Units: Thick faced glass block units, partially evacuated hollow units made of clear, colorless glass with a polyvinyl butyral edge coating.
 - 1. Sizes: Provide nominal 8 inch x 8 inch x 4 inch thick and 12 inch x 12 inch x 4 inch thick units as indicated on Drawings.
 - 2. Pattern and Design: Pittsburgh Corning Decora LX pattern, or equivalent as approved by Architect.

2.03 ACCESSORIES

- A. Panel Reinforcing: two parallel 9 gauge wires either 1-5/8 inch or 2 inch on center with electrically butt-welded crosswires spaced at regular intervals, hot dipped galvanized after welding or Type 304 stainless steel, by Pittsburgh Corning Corporation.
- B. Panel Anchors: 20 gauge perforated steel strips 24 inches long by 1-3/4 inches wide, hot dipped galvanized after perforation or 22 gauge by 16 inches long by 1-3/4 inches wide of Type 304 stainless steel, by Pittsburgh Corning Corporation.
- C. Expansion Strips: made of polyethylene foam with a thickness of 3/8 inch, by Pittsburgh Corning Corporation.
- D. Asphalt Emulsion: a water-based asphalt emulsion, by Karnak Chemical Corp. www.karnakcorp.com.
- E. Sealant (caulk): non-staining, waterproof mastic, silicone type complying with Section 07 92 00.
- F. Packing (Backer Rods): polyethylene foam, neoprene, fibrous glass or equal as approved by sealant manufacturer.
- G. Channels (Aluminum): Available from Julius Blum & Company, Inc. www.juliusblum.com.
 - 1. Premiere Series (4 inch Glass Block) Use: 4-1/2 inch x 2 inch x 1/8 inch size.

2.04 Mortar Materials

- A. Mortar: Limit cementitious materials in mortar to Portland Cement and lime. Type S in accordance with ASTM C270. Mortar shall be 1 part Portland Cement, ½ part lime, and sand equal to 2¼ to 3 times the amount of cementitious material (cement plus lime), all measured by volume. No antifreeze compounds or accelerators allowed.
- B. Portland Cement: Type I in accordance with ASTM C150. If a waterproof Portland Cement is used, the integral type waterproofer shall be omitted. (Masonry Cement is not recommended.)
 - 1. Color: As selected by Architect.
- C. Lime: Shall be a dolomitic pressure-hydrated lime, special hydrate, Type S, in accordance with ASTM C207.
- D. Sand: A clean, white quartzite or silica type, essentially free of iron compounds, in accordance with ASTM C144, not less than 100 percent passing a No. 8 sieve.
- E. Integral Type Water-repellent: Stearate type by The Euclid Chemical Company (Integral Waterpeller® Powder, (Not Liquid), www.euclidchemical.com, or approved equal.
 - 1. Note: Add Integral Waterpeller® powder to dry mortar mix. Do not add powder to wet mortar mix.
- F. External Type Water Proofer: Water based silane sealer type by BASF Corporation (HYDROZO ENVIROSEAL™ 40, www.basf.com).
 - 1. Note: Remove excess sealer from glass surfaces soon after application.

2.05 MIXING

- A. Mortar: Mix to a consistency as stiff as will permit good working and to drier condition than mortar for ordinary brickwork. Retempering mortar after it has taken its initial set is not permitted.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Installer shall examine supporting structure and conditions under which glass unit masonry is to be installed, and notify Contractor, in writing, conditions detrimental to proper and timely completion of Work. Do not proceed with the installation of glass unit masonry Work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.
- B. Verification of Conditions:
 - 1. Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect.
 - 2. Failure to observe this requirement constitutes a waiver to subsequent claims to the contrary.
 - 3. Commencement of Work will be construed as acceptance of subsurfaces.
 - 4. Verify, before proceeding with this Work, that required inspections of existing conditions have been completed.
- C. Do not use glass units with chips, cracks, or other defects which might be visible in the finished Work unless otherwise acceptable to the Architect.

3.02 PREPARATION

- A. Protection: Protect sills, ledges, offsets and other projections from dropping of mortar and grout.
- B. Verify that channels or panels anchors have been provided at head and jambs for the purpose of providing panel anchorage within the opening.

3.03 ERECTION, INSTALLATION, APPLICATION

- A. General Requirements for Glass Unit Masonry Walls:
 - 1. Workmanship: Provide workmanship in accordance with Glass Block Manufacturer and the following. Where these specified requirements conflict with the Manufacturer's printed instructions, Manufacturer's printed instructions shall govern.
 - 2. Erect glass masonry units and accessories in accordance with Manufacturer's instructions.
 - 3. Surface of units shall be clean and free from dirt when laid in walls.
 - 4. Cover sill area with a heavy coat of asphalt emulsion. Allow emulsion to cure at least 2 hours before placing mortar.
 - 5. Where panel anchors are used at jambs and heads in lieu of channel or chase surrounds, install panel anchors in the same joints (16 inches o.c. maximum starting after first course) where panel reinforcing will be laid. Panel anchors are to be embedded a minimum of 12 inches into the mortar joints.
 - 6. Place or adhere expansion strips to jambs and head. Make certain expansion strip extends to sill and covers leg of panel anchor that is attached to jambs and head.
 - 7. Set a full mortar bed joint, applied to sill.
 - 8. Set lower course of block. Maintain a uniform joint width of 1/4 to 3/8 inch plus or minus 1/8 inch. All mortar joints must be full and not furrowed. Steel tools must not be used to tap blocks into position. (Place a rubber crutch tip on end of trowel to tap block into position.) Do not realign, tap or otherwise move block after initial placement.
 - 9. Install panel reinforcing every 16 inches o.c. maximum (starting after the first course) in the horizontal mortar joints. Run reinforcing continuously from end to end of panels. Lap reinforcing not less than 6 inches whenever it is necessary to use more than one length. Do not bridge expansion joints with reinforcing. Install reinforcing as follows:
 - a. Place lower half of mortar in bed joint. Do not furrow.
 - b. Press panel reinforcing into place.
 - c. Cover panel reinforcing with upper half of mortar bed and trowel smooth. Do not furrow.
 - 10. Place full mortar bed for joints not requiring panel reinforcing – do not furrow. Maintain uniform joint width.
 - 11. Set succeeding courses of block. Spaces at head of panel and jambs must remain free of mortar for caulking with sealant.
 - 12. Lay glass masonry units in uniform and true courses, level and plumb to height indicated on Drawings.
 - 13. Use only wooden or rubber tipped tools when tapping glass blocks into place.
 - 14. Strike joints smooth while mortar is still plastic and before final set. Remove surplus mortar from faces of glass blocks and wipe dry. Tool joints smooth and concave before mortar takes final set. At this time, remove and clean out all excess mortar from jambs, head and other locations.
 - 15. After final mortar set (approximately 24 hours), install packing tightly between glass block panel and jamb and head locations. Leave space for sealant.

16. Apply sealant evenly to the full depth of recesses as indicated on the drawings and in accordance with the manufacturers' published application manual and instructions.
 17. All exterior glass block panels shall be well sealed to prevent water entry.
- B. Tolerances:
1. Joints: 1/4 to 3/8 inch thick with a tolerance of plus or minus 1/8 inch.
 2. Variations in vertical and horizontal alignment between adjacent units: plus or minus 1/32 inch.
 3. Variations out of plane between adjacent units: plus or minus 1/16 inch.
 4. Wall Sections: plus or minus 1/8 inch variation 6 feet.
- C. Expansion Joints: Provide expansion joints where shown or where recommended by the Glass Block Manufacturer.
1. Do not fill with mortar.
 2. Install continuous strips of preformed joint filler to allow for installation of backer rod and sealant, specified in Section 07 92 00.

3.04 CLEANING

- A. Remove surplus mortar from the faces of the glass block at the time joints are struck or tooled. Mortar should be removed while it is still plastic using a clean, wet sponge or an ordinary household scrub brush with stiff bristles.
- B. Do not use harsh cleaners, acids (of any strength), abrasives or alkaline materials while cleaning glass block. Never use a wire brush to remove mortar from glass block surfaces.
- C. Final mortar removal is accomplished with a clean, wet sponge or cloth. Rinse sponge or cloth frequently in clean water to remove abrasive particles that could scratch glass surfaces. Allow any remaining film on the block to dry to a powder.
- D. After all sealants, caulking, etc., have been applied, remove excess caulking materials with commercial solvents such as xylene, toluene, mineral spirits or naphtha and follow with normal wash and rinse. Be careful not to damage caulking by overgenerous application of strong solvents.
- E. Final cleaning of glass block panels is accomplished after they are completely installed. Wait until panels are not exposed to direct sunlight. Start at the top of the panel and wash with generous amounts of clean water. Dry all water from the glass block surface. Change cloth frequently to eliminate dried mortar particles or aggregate that could scratch the glass surface. To remove the dry powder from the glass surfaces, use a clean, dry, soft cloth. Remove stubborn or hard to remove powder or stains with "extra fine" steel wool (grades 000 or 0000).

3.05 PROTECTION

- A. In hot and dry weather, protect masonry against too rapid drying.

END OF SECTION

SECTION 05 10 00

STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Structural steel framing including, but not limited to:
 - 1. Columns
 - 2. Beams
 - 3. Lintels
 - 4. Anchor Bolts
 - 5. Bearing Plates
 - 6. Other Miscellaneous Structural Steel Items.
- B. Related Sections:
 - 1. Section 05 50 00 – Metal Fabrications, for miscellaneous metal fabrications and other non-structural steel fabrications.

1.02 SUBMITTALS

- A. Shop Drawings: Submit shop and erection Drawings clearly showing each piece required for fabrication and erection. Drawings shall include material grade, camber, holes and other pertinent data. Indicate welds by standard AWS symbols showing size, length, and type of each weld.
- B. Test Reports: Submit reports for welded connection tests.
- C. Submit anchor setting drawings clearly showing location of all anchor bolts and embedded plates to be anchored in concrete and masonry construction. Provide templates for anchor bolts.

1.03 QUALITY ASSURANCE

- A. Welding:
 - 1. Performed by certified welders in compliance with AWS D.1 Structural Welding Code.
 - 2. Welders shall be duly qualified within the last 12 months in the position in which they are to weld and the qualifications and Specifications for workmanship shall comply with the AWS requirements "AWS Structural Welding Code - Steel."
- B. Certifications:
 - 1. Prior to fabrication or shipment of material to the job site, furnish certification of the Manufacturer of the structural steel that material furnished meets or exceeds requirements of ASTM standards specified or noted on Drawings, for each type of material.
 - 2. Prior to site welding operation, submit welders' written certifications and qualifications, including date of each welder's certification performing work on the Project.
- C. Tolerances: All steel exposed to view shall be architectural steel, and tolerances as a minimum shall comply with section 10 of AISC code of standard practice.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Exercise care during unloading, storage and erection to avoid damage. Dumping on the ground is not permitted.
- B. Support material stored at the site completely free of the ground, and cover to avoid damage from the elements.

PART 2 PRODUCTS

2.01 MATERIALS

- A. General: Materials shall be new, of uniform quality, suitable and without defects affecting the strength or service of the structure.
- B. Structural Steel:
 - 1. Wide Flange: ASTM A992 (Fy = 50 ksi), unless otherwise indicated.
 - 2. Other Rolled Shapes Including Channels, Angles, Plates, Bars and Rods: ASTM A36 (Fy = 36ksi), unless otherwise indicated.
 - 3. All structural rolled members with Fy greater than 36 ksi shall be identified with an ASTM specification mark or tag in accordance with IBC Section 2203.1.
- C. Steel Pipe: ASTM A501 (Fy = 36 ksi), or ASTM A53, Type E or S, Grade B (Fy = 35 ksi).
- D. Steel Tube: ASTM A500, Grade B cold formed (Fy = 46 ksi).
- E. Bolts and Studs: ASTM A307, unless noted otherwise.
- F. Anchor Rods: ASTM F1554, Grade 36.
- G. Welded Anchors and Shear Connectors: ICC approved, as manufactured by KSM or Nelson. Substitutions must have ICC approval and be of equivalent capacity for the intended use.
- H. Welding Rods: AWS A5.0, E70 series, low hydrogen type.
- I. Metal Primer: VOC compliant.
 - 1. Interior Steel: Zinc oxide, alkyd primer, high-solids content, conforming to SSPC-Paint 25.1.
 - 2. Exterior Steel: 2-component, moisture-cured zinc-rich primer conforming to SSPC-PS 12.01.

2.02 FABRICATION

- A. Workmanship and details of construction (except as otherwise indicated or specified) shall be in conformity with applicable articles of the latest AISC Manual, Parts 1 through 4; AISC Specifications; except Section A7 (Design Documents) and Chapter N (Plastic Design); and the applicable building codes. Sections 3.1, 3.4 and 4.2 of AISC code of Standard Practice are specifically excluded from this work.
 - 1. Sections shall be of dimensions, weight and design as indicated, assembled complete at the shop, with base plates and other detailed materials attached.
 - 2. Furnish shims at columns where base plates are shop fabricated to columns.
 - 3. Make connections as indicated or detailed, on the Drawings and the reviewed shop and erection Drawings.

4. Exposed steel shall have smooth, clean surfaces with no identifying trade marks, names etc., exposed to view.
 5. Leave in condition for finish painting.
- B. Bolted connections shall be as detailed or shall conform to AISC standard bolted connections with maximum number of 3/4-inch diameter bolts. See Framed Beam Connections Tables II, III, or IV of AISC Manual of Steel Construction.
- C. Where bolt holes in steel members are enlarged to more than 1/16 inch diameter oversize, provide 3/16 inch x 2-1/2 inch x 2-1/2 inch plate washers to steel members with 3/16 inch fillet weld all around.
- D. Loose Steel Lintels: Provide loose structural steel shape lintels for openings and recesses in masonry walls and partitions, as shown. Weld adjoining members together to form a single unit. Provide not less than 4 inch bearing at each side of openings, unless otherwise shown.
- E. Loose Bearing Plates: Provide loose bearing plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required.

2.03 SHOP WELDING

- A. Make welds by the electric-arc process.
- B. Grind exposed welds smooth.
- C. Where weld size is not indicated, it shall develop full strength of member and connection.

2.04 PAINTING - SHOP COAT

- A. Shop prime all structural steel, except as follows:
1. Steel that is not exposed to weather shall not be painted.
 2. Items of steel and iron Work indicated or specified to be encased in concrete. Partially embedded steel shall have primer applied to area embedded in concrete to a depth of 2 inches.
 3. Surfaces to be welded.
 4. Surfaces to be high-strength bolted with slip-critical connections.
- B. Clean steel Work by wire brushing, or by other means selected by the fabricator, of loose mill scale, loose rust, accessible weld slag, or flux deposit, dirt and other matter before shop coat of paint is applied. Clean in accordance with SSPC SP-6 as required. Remove oil, grease and similar contaminants in accordance with SSPC SP-1.
- C. After cleaning, give steel Work one coat of metal primer. Apply primer thoroughly and evenly to dry surfaces by brush, spray, roller coating, flow coating or dipping at the selection of the fabricator.
- D. Apply primer to provide a wet film of 2.0 mils.
- E. Paint erection marks on painted surfaces. Touch-up surfaces where welding, grinding of welds, joints, etc. are done in the field.
- F. The paint shall be thoroughly dry before the members are handled or loaded.

2.05 SOURCE QUALITY CONTROL

- A. Tests: Where a welded splice is fabricated in beams or columns other than those detailed, fabricator shall have splice connection tested using one of the following methods: magnetic particle, radiographic, or ultrasonic. Testing shall be conducted by an independent testing laboratory and a report submitted to the Architect. The costs of this testing shall be borne by the fabricator.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions:
1. Verify anchor bolt locations, grouting and elevation of base and setting plates, and other material set by other Trades before commencing Work.
 2. Notify Architect of Work set by others which does not comply with specified tolerances. Do not erect material upon such Work until it has been satisfactorily corrected.
 3. Start of Work implies acceptance of Work of other Trades affecting structural frame erection.

3.03 ERECTION

- A. Erect Work to the proper lines and levels, plumb and true, and in correct relation to other Work maintain this condition to completion.
- B. Connections:
1. Machine Bolting:
 - a. Fair-up holes with pins to align holes before bolting.
 - b. Ream unfair holes to obtain alignment or drill new holes.
 - c. Enlargement of holes with drift pins or burning of new holes is not permitted.
 - d. Draw bolts up tight after members are aligned and leveled, and set or deform threads to prevent loosening.
 - e. All high strength bolts shall be installed as bearing type connections with threads included in the shear plane.
 2. Welding:
 - a. Welds shall be per AWS standards and procedures.
 - b. Submit certification that welders have passed AWS code qualification tests.
 - c. Refer to Shop Drawings for weld size and dimensions.
 - d. Close joints exposed to weathering with continuous 1/8 inch weather welds.
 - e. Grind smooth exposed welds, but grinding shall not reduce weld strength or required cross section.
 - f. Protect finish material from damage due to welding.
 - g. Remove unsatisfactory welds by chipping or arc air method.
 3. Connect members temporarily and align completely before making permanent connections.
 - a. Temporary conditions shall consist of bolts in no less than 1/3 of the holes and in no case less than 3 bolts in any single connection.
 - b. Surfaces in contact shall be thoroughly clean when assembled.
 - c. Provide necessary temporary bracing and guying to align the structure properly for permanent connections, and safely resist erection, dead load and wind stress.

- d. Take particular care to have the Work plumb and level (maximum slope ratio tolerance 1 to 500 for interior members, 0 to 1000 for exterior members) before making permanent connections.
 - e. Remove bracing and guys only after permanent alignment and assembly and structure is capable of completely sustaining design and temporary construction loads.
 - C. Exposed Steel:
 - 1. Verify the condition of exposed steel after erection.
 - 2. Exert particular care to provide a neat, accurate installation with members straight and true, corners and edges square, sharp and free from burrs and irregularities, adjacent members perfectly matched and no bolts or rivets exposed.
 - 3. Remove erection bolts and seats and plug weld and grind holes smooth.
 - D. Touch-up Primer Painting:
 - 1. Remove temporary guys, bracing and bracing clips, and grind flush remaining burrs, before painting. Remove welding slag, spatter, rust and burnt paint and wire brush clean welds before touch-up.
 - 2. Touch-up Primer Painting: Touch-up welds, abrasions, bolted connections, and other areas where shop prime paint has been removed or is damaged with specified prime paint.
- 3.04 FIELD QUALITY CONTROL
- A. Field inspections and testing shall be performed by an independent testing and inspection agency in accordance with Section 01 45 00. Refer to general Structural Notes on Drawings for detailed testing requirements.
- 3.05 CLEANING
- A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises.

END OF SECTION

SECTION 05 31 00

STEEL DECK

PART 1 GENERAL

1.01 SYSTEM DESCRIPTION

- A. Design Requirements:
 - 1. Increase S and I properties for simple or two span continuous to achieve equivalent load capacity. Minimum allowable diaphragm shear furnished, per ICC report, shall be as indicated on the Structural Drawings.
 - 2. Sections and properties shall meet AISC Specifications.

1.02 SUBMITTALS

- A. Shop Drawings: Submit shop and erection Drawings showing layout, material and fastening methods and each piece to be erected. Note deck welding pattern and physical properties of decking.
- B. Report: Submit ICC report showing diaphragm shear test.
- C. Prior to site welding operation, submit welders' written certifications and qualifications.

1.03 QUALITY ASSURANCE

- A. Welding: Performed by certified welders in compliance with AWS D.1.3 requirements and procedures for manual shielded metal arc welding.
- B. Certifications: Prior to fabrication or shipment of material to the job site, verify that material furnished meets or exceeds requirements of ASTM standards specified or noted on Drawings, for each type of material.
- C. Maintain on file ICC report showing diaphragm shear test during the course of construction.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle metal decking in manner which will prevent damage or deformation.
- B. Stack decking stored at the site before erection on platforms or pallets, and suitably protect from the weather.
- C. Exercise special care so as not to damage or overload the decking during the construction period.
- D. Do not use metal decking for storage or as a working platform until the sheets have been welded in position.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the following Manufacturers, except as approved otherwise by Architect and Engineer of Record, subject to conformance with Specification requirements:
 - 1. Roof Deck:
 - a. Consolidated Systems, Inc. www.csisteel.com
 - b. Metal Deck, Inc. www.metaldeck.com
 - c. United Steel Deck, Inc. www.njb-united.com/usd.htm
 - d. Verco Manufacturing, Inc. www.vercodeck.com
 - e. Vulcraft Division, Nucor Corp. www.vulcraft.com/sc
 - f. Wheeling Corrugating Division www.wheelingcorrugating.com

2.02 RIBBED DECK

- A. Steel: ASTM A1008, Grade C, having a minimum yield strength of 33 ksi, or as otherwise indicated on General Structural Notes on Drawings.
 - 1. Finish: Galvanized to conform with ASTM A924, Grade 60.

2.03 ACCESSORIES

- A. Provide ridge and valley plates, closures, cant strips, roof sump pans and other accessories where necessary or as shown on Drawings and of same material and finish as steel deck.
- B. Furnish miscellaneous supporting members at openings and edges, as shown on Drawings and as necessary.
- C. Galvanizing Repair Paint: High zinc-dust content paint complying with SSPC Paint 20 (94 percent minimum zinc dust content, dry film, by weight).

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Erector shall examine subsurfaces to receive Work and report detrimental conditions, in writing, with a copy to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Before proceeding, verify that required inspections of existing conditions have been completed.

3.02 ERECTION - RIBBED DECK

- A. Place deck sheets in accordance with approved erection layout Drawings.
- B. Deck units shall be fabricated to span three or more support spacings, with end laps of at least two inches which shall occur over supports. Male joint of side laps shall engage female joint by at least 5/8 inch.

- C. Openings shown on the erection layout Drawings shall be cut by the deck erector. Openings not shown on the erection diagram, such as those required for stacks, conduits, plumbing vents, etc. shall be cut and reinforced if necessary, by the Trade requiring the openings.
- D. Attach deck to supporting members by fusion welding. Care shall be exercised by the welder in the selection of electrodes and amperage to provide positive welds and prevent high amperage blow holes. Welds shall be made from the top side of the deck with the welder following close behind the placement crew.
- E. Ridge and valley plates, closures, cant strips, roof sump pans and other accessories shall be attached directly to the deck to provide a suitable surface for the application of insulation and/or roofing.
- F. Welding washers are not necessary for ribbed deck of 22 gauge or heavier, or when the bottom rib width equals or exceeds 5/8 inch.
- G. Where washers are required, weld deck to steel framing through 16 gauge welding washers with 1 inch x 3/8 inch puddle welds. Maximum weld spacing shall be as follows unless noted otherwise on the Structural Drawings:
 - 1. End and end laps: 6 inches o.c.
 - 2. Intermediate supports: 6 inches o.c.
 - 3. Edges, perimeter beams and angles parallel to deck flutes: 12 inches on center
 - 4. Opening edges: 6 inches on center
- H. Weld sheets to each other with side seam welds at 12 inches on center.

3.03 FIELD QUALITY CONTROL

- A. Tests: When required by the Architect, installation of metal decking and welding shall be subject to inspection by a qualified Testing Agency acceptable to Architect, the cost of which will be paid out of the Testing Allowance.
- B. The Testing Agency shall:
 - 1. Test and inspect metal decking and workmanship to verify compliance with Contract Documents.
 - 2. Check material, equipment, procedures, welds, ability of welders.
 - 3. Furnish Architect with a verified report that completed Work conforms with Contract Documents.

3.04 CLEANING

- A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 05 41 00

STRUCTURAL METAL STUD FRAMING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes cold-formed structural steel stud framing and supplementary items necessary for complete work required for their installation, including, but not limited to clips, stiffeners, bracing and fasteners.

1.02 SYSTEM DESCRIPTION

- A. Design Requirements: Design structural members in accordance with North American AISI "Specification for the Design of Cold-formed Structural Steel."
 - 1. Maximum allowable deflection:
 - a. Walls receiving EIFS: L/240.
 - b. Walls receiving Masonry Veneer: L/600.
 - 2. Design system to provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
 - 3. Design system to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

1.03 SUBMITTALS

- A. Product Data: Submit Manufacturer's Specifications, design data and installation instructions.
- B. Shop Drawings: Submit shop drawings of structural metal stud system. Shop Drawings to include; plans of the metal stud framed areas with sizing and material thickness.
- C. Mill Certificates: Submit Manufacturer's certification that products furnished meet or exceed the specified design requirements. Mill certificates to include uncoated steel thickness, yield strength, tensile strength, total elongation, and galvanized coating thickness
 - 1. Mill Certificates are to be signed by an official representative of the Manufacturer stating that the production materials comply with the component specifications and the published engineering properties.
 - 2. In the absence of the Manufacturers Mill Certificates the contractor may submit test reports from a qualified independent testing agency evidencing compliance with specified requirements.
- D. Research reports or evaluation reports from the model code organization considered acceptable to the building officials having jurisdiction over this project that evidence cold formed metal framing is in compliance with building code in effect for project.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed cold formed metal framing similar in material, design, and extent to that indicated for this project and with a record of successful in-service performance.

- B. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel" and AWS D1.3 "Structural Welding Code--Sheet Steel."
 - 1. Welding: Performed by certified welders in compliance with AWS D1.3 Structural Welding Code Sheet Steel.
- C. Maintain Mill Certification on file with shipment to verify chemical composition, yield strength, tensile strength, elongation and coating thickness. Include listing of applicable ASTM standards specified in this section and comparison of ASTM requirements to actual materials provided to jobsite.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Exercise care during unloading, storage and erection to avoid damage. Dumping on the ground is not permitted.
- B. Support material stored at the site completely free of the ground, and cover to avoid damage from the elements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products as Manufactured by a Manufacturing member of the Steel Stud Manufacturers Association (SSMA) www.ssma.com, subject to compliance with Specification requirements.

2.02 MATERIALS

- A. All studs, track, bracing and bridging shall conform to ASTM C955 – "Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases". All cold formed products to be fabricated from galvanized steel sheet that conforms to ASTM A653A with G60 hot-dip galvanized coating / A653M Zinc-Iron Alloy-Coated (Galvannealed) hot dip process.
 - 1. Minimum Gauge: Design uncoated-steel thickness to a minimum of 0.0359 inch (20 gauge), thickness to be increased as required for structural performance.
 - 2. Grade: Grade D, 50,000 psi minimum yield strength.
 - 3. Elongation: Limit elongation to 12 percent.
 - 4. Coating Designation: G-60 Hot dip Galvanized.
- B. Studs: All stud framing members shall be of the type, size, gauge, and spacing required to meet specified loading and design criteria. Manufacturer's standard C-shaped steel studs of web depths indicated, with lipped flanges, and complying with the following:
 - 1. Flange width: 2 inches.
 - 2. Web: punched or un-punched as noted herein.
 - 3. Punch-outs may not be located within six inches of structural anchors.
- C. Track: Channel shaped; same width as studs, for tight fit; minimum 16 gauge solid web, galvanized.
 - 1. Design uncoated-steel thickness to a minimum of 0.0359 inch (20 gauge); thickness to increase as required by structural performance.
 - 2. Flange Width: Manufacturers deep flange where indicated, standard flange elsewhere.

- D. Framing Accessories: Manufactured from galvanized sheet steel, thickness to be determined for actual project conditions.

2.03 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A36, zinc coated by the hot-dip process according to ASTM A123.
- B. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 x the design load, as determined by testing per ASTM E488 conducted by a qualified independent testing agency.
- C. Powder-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 the design load, as determined by testing per ASTM E1190 conducted by a qualified independent testing agency.
- D. Mechanical Fasteners: Corrosion-resistant coated, self-drilling, self-threading steel drill screws, type appropriate for attachment detail requirements with penetration through joined materials not less than 3 exposed threads.
 - 1. Fastener Head Type:
 - a. Low-profile fastener heads required beneath sheathing, Manufacturer's standard fasteners elsewhere.
 - b. Hex Washer Head for dynamic framing connections.
- E. Welding Electrodes: Comply with AWS standards and as indicated on General Structural Notes on Drawings.

2.04 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.

2.05 FABRICATION

- A. Fabricate structural metal stud framing and accessories plumb, square, true to line, and with connections securely fastened, according to Manufacturer's recommendations and the requirements of this Section.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed steel stud framing members by welding or screw fastening. Shop welding of 0.0747 inch (14 gauge) or thicker components is acceptable. Wire tying of framing members is not permitted.
 - a. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to cold-framed steel stud framing Manufacturer's instructions with screw penetrating joined members by not less than 3 exposed screw threads.
 - 4. Fasten other materials to cold-formed steel stud framing by welding, bolting, or screw fastening, according to Manufacturer's recommendations.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or distortion.

- C. Fabrication Tolerances: Fabricate assemblies to a maximum allowable tolerance variation from plumb, level, and true to line of 1/8 inch in 10 feet (1:960) and as follows:
 - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 - 2. Square: Fabricate each cold-formed steel stud framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

- A. Cold-formed steel stud framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel stud framing according to ASTM C1007, unless more stringent requirements are indicated or required by conditions.
- C. Install cold-formed steel stud framing and accessories plumb, square, true to line, and with connections securely fastened, according to Manufacturer's recommendations and the requirements of this Section.
 - 1. Space studs at 16 inches on center maximum unless otherwise indicated on Drawings. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed steel stud framing members by screw fastening. Wire tying of framing members is not permitted.
 - a. Locate mechanical fasteners and install according to cold-framed steel stud framing Manufacturer's instructions with screw penetrating joined members by not less than 3 exposed screw threads.
- D. Install framing members in one-piece lengths, unless splice connections are indicated for track or tension members.
- E. Provide temporary bracing and leave in place until framing is permanently stabilized.
- F. Do not bridge building expansion and control joints with cold-formed steel stud framing. Independently frame both sides of joints.
- G. Install insulation in built-up exterior framing members, such as headers, sills, boxed joists, and double studs, inaccessible upon completion of framing work.
- H. Fasten reinforcement plate over web penetrations that exceed size of Manufacturer's standard punched openings.

- I. Erection Tolerances: Install cold-formed steel stud framing to a maximum allowable tolerance variation from plumb, level, and true to line 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.

3.03 NONLOAD-BEARING CURTAINWALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as required by Structural Drawings.
- B. Squarely seat studs against webs of top and bottom tracks. Fasten both flanges of studs to top and bottom track, unless otherwise indicated in the shop drawings.
- C. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.
- D. Isolate steel framing from building structure at locations indicated to prevent transfer of vertical loads while providing lateral support.
 1. Install deflection track with deep or slotted flanges and anchor to building structure.
 2. Connect studs with vertical slide expansion/contraction joint and supplementary framing anchored to building structure.
- E. Install horizontal bridging in curtain wall studs, spaced in rows not more than 48 inches apart. Fasten at each stud intersection.
 1. Install additional row of horizontal bridging in curtain wall stud beneath deflection track when curtain wall studs are not fastened to an additional top track.
 2. Bridging: Cold-rolled steel channel, clip angle fastened to webs of punched studs or flat, steel-sheet straps of width and thickness indicated, fastened to stud flanges.
- F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable curtain wall-framing system.

3.04 FIELD QUALITY CONTROL

- A. Testing Agency: Qualified independent testing agency employed and paid by Owner will perform field quality-control testing.
- B. Shop and field welds will be subject to inspection and testing.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Remove and replace Work that does not comply with specified requirements.
- E. Additional testing will be performed to determine compliance of corrected Work with specified requirements.

3.05 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel stud framing with galvanizing repair paint according to ASTM A780 and Manufacturer's instructions.

- B. Provide final protection and maintain conditions in a manner acceptable to Manufacturer and Installer to ensure that cold-formed steel stud framing is without damage or deterioration at time of Substantial Completion.

3.06 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 05 50 00

METAL FABRICATIONS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Metal fabrications, including items fabricated from iron and steel shapes, plates, bars, strips, tubes, pipes and castings which are not a part of structural steel or other metal systems in other Sections of these Specifications. Types of metal items include, but are not limited to, the following:
 - 1. Carpenter's ironwork.
 - 2. Roof access ladders.
 - 3. Miscellaneous framing and supports including, but not limited to the following:
 - a. Supports for overhead supported finishes, fixtures, equipment and other items as necessary.
 - b. Supports for overhead supported doors.
 - c. Steel tube countertop supports.
 - d. Applications where framing and supports are not specified in other sections.
 - e. Other items as indicated.
 - 4. Miscellaneous steel trim.
 - 5. Other items as indicated or required.

1.02 SUBMITTALS

- A. Shop Drawings: Submit Drawings for the fabrication and erection of assemblies of items which are not completely shown by the Manufacturer's data sheets.
 - 1. Include plans and elevations at not less than 1 inch to 1'-0" scale, and include details of sections and connections at not less than 3 inches to 1'-0" scale.
 - 2. Show anchorage and accessory items.

1.03 QUALITY ASSURANCE

- A. Standards: Comply with the following, except as otherwise shown and specified:
 - 1. AISC "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings."
 - 2. AISI "Specifications for the Design of Cold-Formed Steel Structural Members."
 - 3. AWS "Structural Welding Code-Steel."
 - 4. ASTM A6 "General Requirements for Rolled Steel Plates Shapes, Sheet Piping and Bars for Structural Use."
- B. Qualifications: Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure."

1.04 DELIVERY, STORAGE AND HANDLING

- A. Exercise care during unloading, storage and erection to avoid damage. Dumping on the ground is not permitted.
- B. Support material stored at the site completely free of the ground, and cover to avoid damage from the elements.

1.05 PROJECT/SITE CONDITIONS

- A. Field Measurements: Take field measurements prior to preparation of Shop Drawings and fabrication, where possible, to ensure proper fitting of the Work. Allow for trimming and fitting wherever the taking of field measurements before fabrication might delay the Work.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Steel Shapes, Plates, Rod, Bars and Bar-size Shapes: ASTM A36.
- B. Steel Pipe: ASTM A501 (Fy = 36 ksi), or ASTM A53, Type E or S, Grade B (Fy = 35 ksi).
- C. Steel Tube: ASTM A500 (Fy = 46 ksi).
- D. Cold-Finished Carbon Steel Bars: ASTM A108, Grade as selected by fabricator.
- E. Hot-rolled Carbon Steel Sheets and Strips: ASTM A568 and ASTM A1011, pickled and oiled.
- F. Cold-rolled Carbon Steel Sheets: ASTM A1008.
- G. Hot-dip Galvanized Steel Sheets: ASTM A653, with G90 zinc coating.
- H. Cold-drawn Steel Tubing: ASTM A512, sunk drawn, butt welded, cold-finished and stress-relieved.
- I. Slotted Channel Framing (Unistrut): 1-5/8 inch by 1-5/8 inch slotted channel framing system as manufactured by Unistrut, or as approved. Galvanized G90, cold-formed metal channels with flange edges returned toward web with 9/16 inch wide slotted holes in webs at 2 inches o.c.
 - 1. Provide Manufacturer's standard connectors, fasteners and other miscellaneous accessories as required for a complete installation and connection to supporting structure and as necessary for support of ceiling elements and other items supported.
- J. Gray Iron Castings: ASTM A 48, Class 30.
- K. Malleable Iron Castings: ASTM A 47, Grade 32510.
- L. Anchors:
 - 1. Masonry Anchorage Devices: Expansion shield, FS FF-S-325.
 - 2. Toggle bolts: Tumble-wing type, FS FF-B-588; type, class and style as required.
 - 3. Chemical Type Anchors: 2-component chemically curing anchors for concrete or masonry construction, capsule or injection type, designed to accept Manufacturer's galvanized anchor rod.
 - 4. Threaded-type concrete inserts: Galvanized ferrous castings, internally threaded to receive 3/4 inch diameter machine bolts; either malleable iron complying with ASTM A47 or cast steel complying with ASTM A27; hot-dip galvanized in compliance with ASTM A153.

5. Wedge-type concrete inserts: Galvanized box-type ferrous castings, designed to accept 3/4 inch diameter bolts having special wedge-shaped heads, either malleable iron complying with ASTM A47 or cast steel complying with ASTM A27; hot-dip galvanized in compliance with ASTM A153.
 6. Provide carbon steel bolts having special wedge-shaped heads, nuts washers and shims; all galvanized in compliance with ASTM A153.
- M. Fasteners: Provide zinc-coated fasteners with galvanizing complying with ASTM A153 for exterior use or where built into exterior walls. Select fasteners for the type, grade and class required for the installation of miscellaneous metal items.
1. Bolts and nuts: ASTM A307, Grade A, regular hexagon head.
 2. Bolts, hexagon and square: ANSI B-18.2.1.
 3. Bolts, round head: ANSI B-18.5.
 4. Lag bolts: Square head type.
 5. Wood screws: ANSI B-18.6.1, flat head carbon steel.
 6. Plain washers: ASTM F844 helical spring type carbon steel.
- N. Metal Primer: VOC compliant.
1. Interior Steel: Zinc oxide, alkyd primer, high-solids content, conforming to SSPC-Paint 25.1.
 2. Exterior Steel (exposed, where indicated to be painted): Tnemec Tneme-Zinc 90-97 (organic).

2.02 ACCESSORIES

- A. Inserts and Anchorages: Furnish inserts and anchoring devices to be set in concrete or built into masonry for installation of Miscellaneous Metal Work. Provide setting Drawings, templates, instructions and directions for installation of anchorage devices.

2.03 FABRICATION

- A. General: For fabrication of Miscellaneous Metal Work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness. Remove such blemishes by grinding or by welding and grinding, prior to cleaning, treating and application of surface finishes, including zinc coatings.
- B. Shop Assembly: Preassemble items in shop, when possible, to minimize field splicing and assembly of units at the site. Disassemble units only to extent necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- C. Workmanship:
1. Use materials of the size and thickness shown, or if not shown, of the required size and thickness to produce adequate strength and durability of the finished product for the intended use. Work to the dimensions of fabrication and support. Use type of materials shown or specified for various components of Work.
 2. Form exposed Work true to line and level with accurate angles, surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32 inch unless otherwise shown. Form bent-metal corners to the smallest radius possible without causing grain separation or otherwise impairing the Work.
 3. Weld corners and seam continuously and in accordance with the recommendations of AWS. Grind exposed welds smooth and flush to match and blend with adjoining surfaces.
 4. Form exposed connections with hairline joints which are flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of the type shown, or if not shown, use Phillips flat-head (countersunk) screws or bolts.

5. Provide for anchorage of type shown, coordinated with supporting structure and the progress schedule. Fabricate as required to provide adequate support for the intended use of the Work.
 6. Cut, reinforce, drill and tap Miscellaneous Metal Work as may be required to receive finish hardware and similar items of Work.
 7. Use hot-rolled steel bars for Work fabricated from bar stock, unless Work is indicated to be fabricated from cold-rolled, or cold-finished stock.
- D. Carpenter's Iron Work:
1. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware are specified in Division 6 Sections.
 2. Manufacture or fabricate items of sizes, shapes and dimensions required. Furnish malleable iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.
- E. Miscellaneous Framing and Supports:
1. Provide miscellaneous steel framing and supports which are not a part of the structural steel framework, or other metal systems in other Sections of these Specifications, whether indicated or not as necessary to complete Work.
 2. Fabricate miscellaneous units to sizes, shapes and profiles shown, or if not shown, of the dimensions required to receive adjacent grating, plates, doors or other Work to be retained by the framing. Except as otherwise shown, fabricate from structural steel shapes and plates and steel bars of all welded construction using mitered corners, welded brackets and splice plates, and a minimum number of joints for field connection. Cut, drill and tap units to receive hardware and similar items to be anchored to the Work.
 3. Equip units with integrally welded anchor straps for casting into concrete or building into masonry wherever possible. Furnish inserts if units must be installed after concrete is poured. Except as otherwise shown, space anchors 24 inches o.c., and provide minimum anchor units of 1-1/4 inch x 1/3 inch x 8 inch steel straps.
 4. Countertop Supports: Fabricate countertop supports from steel tube and shapes as detailed on Drawings. Continuously weld all joints and grind smooth where exposed.
- F. Ladders:
1. Fabricate ladders for the locations shown, with dimensions, spacings, details and anchorages as required. Comply with requirements of ANSI A14.3, except as otherwise shown.
 2. Fit rungs into punched holes in centerline of side rails, plug weld and grind smooth on outer rail faces.
 3. Support each ladder at top and bottom and at intermediate points spaced not more than 5 feet o.c. Use welded or bolted steel brackets, designed for adequate support and anchorage, and to hold the ladder 7 inches clear of the wall surface and other obstructing construction. Extend rails 42 inches above top rung, and return rails to wall or structure unless other secure handholds are provided. If the adjacent structure does not extend above the top rung, gooseneck the extended rails back to the structure to provide secure ladder access.
 4. Provide non-slip surfaces on the top of each rung, either by coating the rung with aluminum oxide granules set in epoxy resin adhesive, or by using a type of manufactured rung which is filled with aluminum oxide grout.
 5. Exterior ladders shall have hot-dipped galvanized finish.

- G. Miscellaneous Steel Trim: Provide shapes and sizes as required for the profiles shown. Except as otherwise noted, fabricate units from structural steel shapes and plates and steel bars, with continuously welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings and anchorages as required for coordination of assembly and installation with other Work.
- H. Prevent galvanic action and other forms of corrosion by insulating contact points between metals and incompatible metals or materials. Provide separation of resilient gasket or other appropriate material to separate aluminum bar gratings and angles where units are attached to steel.

2.04 FINISHING

- A. Shop Painting:
 - 1. Shop paint Miscellaneous Metal Work, except those members or portions of members to be embedded in concrete or masonry, surfaces and edges to be field welded, and galvanized surfaces, unless otherwise indicated.
 - 2. Remove scale, rust and other deleterious materials before shop coat of paint is applied. Clean in accordance with SSPC SP-2, SP-3, or SP-7, as required. Remove oil, grease and similar contaminants in accordance with SSPC SP-1.
 - 3. Apply one shop coat of metal primer paint to fabricated metal items, except apply 2 coats of paint to surfaces which are inaccessible after assembly or erection.
 - 4. Immediately after surface preparation, brush or spray on metal primer paint in accordance with Manufacturer's instructions, and to provide a uniform dry film thickness of 2 mils for each coat.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply items required to be cast into concrete or embedded in masonry with setting templates to appropriate Trades.
- C. Set sleeves in concrete with tops flush with finish surface elevations. Protect sleeves from water and concrete entry.

3.03 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Field weld components indicated on Shop Drawings.

- D. Perform field welding in accordance with AWS D1.1.
- E. Obtain Architect approval prior to site cutting or making adjustments not scheduled.
- F. Prevent galvanic action and other forms of corrosion by insulating contact points between metals and incompatible metals or materials. Provide separation of resilient gasket or other appropriate material to separate aluminum bar gratings and angles where units are attached to steel.
- G. Touch-up Painting: Touch-up welds, abrasions, and other areas where shop prime paint has been removed or is damaged with specified prime paint or galvanizing repair paint.

3.04 ERECTION TOLERANCES

- A. Maximum Variation from Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset from True Alignment: 1/4 inch

3.05 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises.

END OF SECTION

SECTION 05 52 00

METAL RAILINGS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes standard steel pipe and tube handrails and railings as shown on Drawings and as specified herein.

1.02 SYSTEM DESCRIPTION

- A. Structural Performance of Handrails and Railing Systems: Fabricator shall design, fabricate and install railings and handrails to comply with ASTM E985 based on testing in accordance with ASTM E894 and E935 and requirements of IBC Section 1607.7.
- B. Engineering Responsibility: The railing fabricator shall be responsible for structural design and engineering required for Work of this Section to meet specified performance requirements within physical and aesthetic requirements established.

1.03 SUBMITTALS

- A. Shop Drawings: Submit Drawings showing dimensions, details, erection diagrams and connections with other work. Include structural design analysis showing compliance with Code and Performance Requirements.
 - 1. Shop Drawings and structural design analysis shall be sealed and signed by a qualified engineer responsible for their design.

1.04 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with local code and regulatory agency requirements for handrail and railing design and the following:
 - 1. ANSI A117.1, 2009 "Accessible and Usable Buildings and Facilities."
 - 2. Public Law 101-336 "The Americans with Disabilities Act of 1990 (ADA).
 - 3. 2010 ADA Accessibility Guidelines (ADAAG).
 - 4. The Arizonans with Disabilities Act of 1992 Administrative Rules (AzDAAG)
- B. Engineer Qualifications: A qualified engineer who is registered in the State of Arizona and who is experienced in providing engineering services of the kind indicated for metal handrails and railing similar to those of this Project in material, design, and extent.
- C. Welding: Conforming to AWS D1.1 and performed by certified welders.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in manufacturer's original unopened packaging with labels intact. Protect finished surfaces with removable wrapping or coating which will not bond when exposed to sunlight.
- B. Storage: Adequately protect against damage while stored at the site.
- C. Handling: Comply with manufacturer's instructions.

1.06 PROJECT/SITE CONDITIONS

- A. Field Measurements: Verify existing conditions by taking field measurements.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Structural Steel Shapes, Plates, Bars and Bar-size Shapes: ASTM A36.
- B. Steel Tubing: ASTM A500, Grade B (Fy = 46 ksi).
- C. Metal Primer: VOC compliant.
 - 1. Interior Steel: Zinc oxide, alkyd primer, high-solids content, conforming to SSPC-Paint 25.1.
- D. Finish Painting: In accordance with Section 09 91 00.
- E. Gray Iron Castings: ASTM A48, Class 30.
- F. Malleable Iron Castings: ASTM A47, Grade as selected.
- G. Steel Pipe: ASTM A53, type as selected, Grade A standard weight (Schedule 40).
- H. Wall Bracket (Pipe Handrails): Julius Blum #382 www.juliusblum.com, or equivalent as approved by Architect, with appropriate fasteners and anchor plate.

2.02 FABRICATION

- A. Shop Assembly:
 - 1. Conform with AISC Standard Specifications, Rules and Practice in the "Steel Construction Manual."
 - 2. Preassemble items in shop to the greatest extent possible to largest practicable sizes to minimize field splicing/welding and assembly of units at the site.
 - 3. Limit size of shop assembled units only to extent necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
 - 4. Form and fabricate the Work to meet installation conditions.
 - 5. Include accessories to adequately secure the Work in place.
 - 6. Make provisions to connect with or to receive abutting construction.
- B. Make connections between members, unless otherwise indicated by welding.
 - 1. Cope and cut components for hairline fit prior to welding.
 - 2. Accurately align members.
 - 3. Fabricate joints watertight for exterior applications.
 - 4. Welds shall be flush type, with fillets dressed to uniform radius, using the shielded arc method.
- C. Where bolted or screw connections are indicated or necessary, use round or oval head bolts and tamper-resistant screws and conceal in the finished work to the greatest extent possible.
- D. Fabricate railings with no open end conditions. Handrails shall turn back to itself, floor surface or wall surface and terminate with 1/4 inch maximum gap between finished floor, railing or wall surface and end of rail in accordance with IBC requirements. Close end of pipe/tube rails at terminations with end cap or welded plate ground smooth.

- E. Fabricate guard railings with minimum height of 43 inches. Fabricate guard railings with intermediate rails spaced such that a 4 inch sphere cannot pass through at any location in accordance with IBC 2006.
- F. Grind welds, projections and corners in finished surfaces smooth. No identifying marks shall remain exposed.
- G. Shop/Factory/Finishing: Clean surfaces of grease, rust, mill scale, and other foreign matter, and apply coat of primer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

- A. Install steel railings and handrails at locations indicated.
- B. Install posts and vertical members plumb within 1/8 inch of vertical. Install longitudinal members parallel with each other and to floor surfaces or slope of stairs to within 1/8 inch per 10 running feet.
- C. Wall brackets shall be welded to supporting steel structure or securely anchored to other supporting structure with screws or bolts to solid backing as detailed on Drawings and as required to comply with performance requirements.
- D. Grind welds in finished surfaces smooth with no identifying marks remaining exposed.
- E. Touch-Up Painting: After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

3.03 CLEANING

- A. During the course of the Work and on completion of the Work, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 06 10 00

ROUGH CARPENTRY

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Rough carpentry including, but not limited to:
 - 1. Dimensional lumber framing.
 - 2. Wall and roof sheathing.
 - 3. Plywood telephone and electrical backer boards.
 - 4. Miscellaneous backing, blocking, nailers, sleepers and curbs.
 - 5. Other items as shown on the Drawings and as specified herein.

1.02 SUBMITTALS

- A. Product Data: Submit technical data for wood preservative and fire retardant products.

1.03 QUALITY ASSURANCE

- A. Identify each piece of lumber or plywood used for structural framing with grade and trade mark of a lumber grading organization. Trade mark of manufacturer shall also appear on each piece.
- B. Grading Rules: Conform with applicable requirements of American Lumber Standards "Simplified Practice Recommendation R-16" and to grading rules of manufacturer's association under whose rules the lumber is produced.
- C. Standards: Conform with requirements of The Engineered Wood Association, U. S. Dept. of Commerce Commercial Standards and American Wood Preservers Institute Standards (www.preservedwood.com), as they apply.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in manufacturer's original unopened packaging with labels intact.
- B. Storage: Store off ground to assure adequate ventilation, and protect against damage while stored at the site.
- C. Handling: Comply with manufacturer's instructions.

1.05 PROJECT CONDITIONS

- A. Environmental Requirements: Store materials for which a maximum moisture is specified in areas where humidity can be controlled.

PART 2 PRODUCTS

2.01 LUMBER MATERIALS

- A. Species: Douglas Fir – Larch, Hem Fir graded in accordance with Standard Grading and Dressing Rules of WCLIB. Framing lumber shall be stress grade. All sides shall be surfaced.

- B. Lumber Grades: Provide dimensional lumber framing of grades indicated on General Structural Notes on Drawings, and the following:
 - 1. One inch boards: Construction.
 - 2. Misc. blocking, bridging, etc: Utility.
 - 3. Grounds and furring: Construction Grade Douglas Fir or No. 2 White Pine.
- C. Moisture Content:
 - 1. Lumber shall be air-dried or kiln-dried.
 - 2. At time of installation, moisture content, expressed as a percentage of the weight of the oven-dry wood, shall not exceed 19 percent for lumber of up to two inches nominal thickness.
 - 3. Moisture content of lumber over two inches nominal thickness shall conform to the rules of the association under which it is graded.

2.02 SHEATHING MATERIALS

- A. General:
 - 1. Panel thickness and identification index shall be as shown on the Drawings and as specified and shall also be stamped on each piece of sheathing.
 - 2. Design of project is based upon plywood sheathing, however, OSB Board may be substituted for plywood if it conforms to all requirements for plywood installed in like locations.
 - 3. Plywood (or OSB Board where allowed) which has an edge or surface permanently exposed to the weather shall be exterior type.
- B. Plywood: Each panel of softwood plywood shall be identified with the APA grade-trademark and shall meet the requirements of PS-1-83 for softwood plywood.
- C. Plywood Backing Panels: For mounting of telephone and electrical equipment, provide Grade C-D Exposure 1 plywood panels, 15/16 inch thick, unless otherwise indicated.
- D. OSB Board:
 - 1. Raw materials used in panel shall be manufactured from wood products conforming to ANSI A201.1.
 - 2. Each piece shall be stamped in accordance with American Plywood Associations (APA) grade rules and shall meet requirements of latest edition of U.S. Product standard for Softwood Plywood.
 - 3. Provide Grade 2-M-W or 2-M-F as required for thickness and application.

2.03 FACTORY WOOD TREATMENT

- A. Preservative Treatment:
 - 1. Materials:
 - a. Chromated copper arsenate (CCA) shall not be allowed.
 - b. Provide ammoniacal copper quaternary (ACQ) or copper boron azole (CBA) as produced by the following manufacturers:
 - 1) Lonza Wood Protection www.wolmanizedwood.com or www.naturalselect.com.
 - 2) Viance Treated Wood Solutions; Viance, LLC www.treatedwood.com
 - 3) Osmose, Inc., Wood Preserving Division, www.osmosewood.com.

2. Locations Required:
 - a. Wood sillplates and ledgers bolted in direct contact with concrete foundations and slabs-on-grade or masonry located at or below grade only shall be pressure treated lumber.
 - b. Blocking occurring on top of or above the roof deck, including the nailer beneath the flashing at parapet caps, shall be treated lumber.
 - c. Other locations as required by Code.
- B. Fire-Retardant Treatment: Lonza Wood Protection www.wolmanizedwood.com Dricon FRTW, or Hoover Treated Wood Products www.frtw.com, Pyro-Guard; in accordance with UL label.
 1. Where required by code or indicated on Drawings, wood studs, furring, plates, sheathing, blocking, etc. shall be fire-retardant treated.
 2. All wood utility backer panels shall be fire-retardant treated.
 3. Dimensioned lumber shall be kiln dried to a maximum moisture content of 18 percent before and after milling and fire protective treatment.

2.04 ACCESSORIES

- A. Nails: Common wire, galvanized for exterior Work, meeting ASTM F1667 of the sizes indicated on the Drawings.
- B. Screws: Standard domestic manufacture, bright steel, except galvanized for exterior use and of brass, bronze, aluminum or stainless steel when used to attach items made of those materials. Screws used for attaching interior trim and finish to drywall partitions shall be Type S self-drilling, self-tapping corrosion resistant coated steel drywall screws of required lengths as specified in Section 09 29 00.
 1. Screws used for attaching preservative treated wood shall be Type S self-drilling, self-tapping corrosion resistant coated steel screws. Acceptable products include the following:
 - a. DEC-KING Exterior Wood Screw with Climacoat.
 - b. Tapcon Concrete Anchor with Blue Climaseal or White UltraShield.
 - c. Wood-To-Metal TEKS with Grey Spex.
 - d. Roofgrip with Spex or Blue Climaseal.
 - e. GY-FAST Nail with Climacoat.
 - f. Maxi-Set Tapcon White UltraShield.
- C. Bolts: Standard mild steel, square head machine bolts with square nuts and malleable iron or steel plate washers or carriage bolts with square nuts and cut washers as indicated. Bolts, nuts and washers, wholly or partially exposed on exterior shall be galvanized.
- D. Structural Bolts: Machine bolts, or carriage bolts, of structural grade steel with square nuts, conforming to ASTM A307.
- E. Steel plates and angles: ASTM A36, galvanized after fabrication.
- F. Lag screws, shear plates and split ring connectors: Conform to requirements of the "National Design Specifications for Stress Grade Lumber and its Fastenings" of National Forest Products Association.
- G. Framing anchors and joist hangers: Simpson Company products or similar devices as approved by Structural Engineer through Architect and noted on Drawings.
- H. Power driven inserts: Ramset, or as approved by Structural Engineer through Architect meeting FS GGG-D-777a. Install as per manufacturer's printed directions. Charge shall be powerful enough to prevent spalling of concrete.

- I. Galvanizing: ASTM A653.
- J. Toggle Bolts: FS FF-B-588.
- K. Fabricated Connections:
 - 1. Sheet metal galvanized of size and type shown on Drawings.
 - 2. Structural Steel: ASTM A36. Welding by qualified welders in conformance with AWS D1. One shop coat of paint per Federal Specification TT-P-86, Type II to parts not embedded.
- L. Sill Sealer Gasket: Owners Corning "FoamSealR" or GreenGuard Sill Sealer; 1/4 inch foam sill plate gasket, or equivalent as approved by Architect.
- M. Joint Sealant: Silicone sealant complying with Section 07 92 00.

PART 3 EXECUTION

3.01 FRAMING

- A. Coordination: Install wood framing making proper provisions for Work of other trades. Cut wood required to accommodate plumbing, heating and ventilating, electrical and other trades. Fit neatly around exposed items, as outlet boxes, conduit, pipes and ducts. Protect adjacent Work. Before proceeding with rigid sheathing, make certain required inspections have been made by Building Official.
- B. Structural Members: No cutting, notching or drilling without prior approval of the Structural Engineer through the Architect.
- C. Wood Backing: Provide wood backing, furring, stripping or blocking indicated or required for installation and attachment of work of other trades. Provide fire-proofed wood backing approved by Building Official where required by Code in noncombustible or fire-rated construction.
- D. Connections: Subdrill where necessary to avoid splitting.
- E. Bolts: Drill bolt holes 1/32 inch larger than bolt diameter. Use square plate or malleable iron washers under heads and nut where they bear against wood. Re-tighten bolts immediately prior to concealing with finish materials. Re-tighten exposed bolts immediately prior to final inspection by Building Official.
- F. Lag Screws and Screws: Subdrill, use square plate or malleable iron washer under lag screw heads when they bear on wood.
- G. Exterior base plates or sills resting on concrete: Set sill plates on sill sealer gasket. Size plates or sills and set level and true to line. Bolt down with bolts of size, length and spacing indicated with a bolt not more than 9 inches from the end of any piece.
- H. Apply a continuous bead of joint sealant at interior side of top of sill plate and exterior wall sheathing. Clean sill plate and wall cavity area of all dirt and debris before applying joint sealant.

- I. Rough Framing: Fit closely, set accurately to required lines and levels, and secure rigidly in place. Set horizontal and inclined members with crown edge up. Reinforce cut members as directed by Structural Engineer through Architect. Bolt, nail and spike in a thorough manner with not less than the sizes and quantities indicated or specified. Structural members shall provide full contact at bearing surfaces.
- J. Studs: Wall and partitions shall be nominal 2x4 and 2x6 studs 16 inches on center unless otherwise noted or unless they are required to be larger to accommodate mechanical or electrical equipment, piping and fixtures or equipment of any other Trade. Unless otherwise detailed, panels, valve covers, cleanouts, devices, access doors, recessed cabinet boxes, etc., shall be mounted flush with the adjacent wall surface. When any such item is of a depth where it is not practical to use solid studding to the full thickness of the wall, then the wall shall be furred. When furring is required, it shall extend the full width and from floor to roof or ceiling joists. The studs comprising interior partitions and the wall material affixed thereto shall extend from floor to roof or ceiling joist framing except as shown. Staggered stud walls shall be constructed where shown on plans and as detailed.
- K. Top plates in bearing partitions: Shall be doubled and lapped at each intersection with walls or partitions. Stagger joints in upper and lower members of top plate not less than 4 feet.
- L. Provide blocking not less than 2 inches in thickness of same width as stud as follows:
 - 1. Stud partitions or walls more than 8 feet , but not more than 14 feet in height: One row of blocking fitted snugly and nailed into mid-height of stud.
 - 2. Walls or partitions over 14 feet in height: 2 or more rows of blocking. Locate rows of blocking so that in no case will the distance between sole or top plates and blocking or between lines of blocking exceed 8 feet.
 - 3. Provide solid fire blocking at ceiling line at dropped ceilings and at other locations indicated on Drawings or required by Code.
- M. Frame corners solid where stud walls or partitions meet or as shown on the Structural Drawing.
- N. Provide double joists under partitions parallel to joists, and for headers and side members at openings larger than 4 feet in dimension.
- O. Joist framing into headers and header joists shall be supported on joist hangers.
- P. At roofs: Provide crickets, cants, equipment curbs (except where indicated to be a pre-manufactured curb specified elsewhere, wood saddles, cant strips, curbs for plywood at parapet walls; other miscellaneous backing, blocking, curbing, and wood nailers bolted to tops of concrete or masonry and at expansion joints, as specified or required.

3.02 PLYWOOD SHEATHING

- A. General: Comply with applicable recommendations contained in APA Form No.E30, "APA Engineered Wood Construction Guide," for types of structural use panels and applications indicated.
 - 1. Comply with "Code Plus" of the above-referenced guide.
- B. Securely attach to substrate by fastening as indicated, complying with the following:
 - 1. ICC NER-272 for power-driven fasteners.
 - 2. IBC Table 2304.9.1, Fastening Schedule."
- C. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

- D. Sheathing shall have edges blocked and nailed for diaphragm or shear wall stresses as shown on the Drawings.
- E. At non-tongue and groove sheathing, provide plywood clips at 24 inches O.C. maximum at unsupported or unblocked edges.

3.03 PLYWOOD BACKING PANELS

- A. Plywood Backing Panels: Install with the “C” or best face on exposed side.

3.04 CLEANING

- A. During the course of the Work and on completion, remove excess materials, equipment and debris and dispose of away from premises.

END OF SECTION

SECTION 06 17 00

MANUFACTURED STRUCTURAL WOOD

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Wood I-Joists.

1.02 SUBMITTALS

- A. Shop Drawings: Submit Shop Drawings for review before fabrication begins, conforming to the design load criteria shown on the Drawings.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Members shall be stored in a vertical position, in a dry place, completely protected from the weather. Members shall be handled with care to prevent damage.

1.04 PROJECT CONDITIONS

- A. Verify dimensions shown on Drawings by taking field measurements; proper fit and attachment of members is required.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Furnish products of one of the following manufacturers, except as approved by the Architect, subject to compliance with specifications requirements:
 - 1. Georgia-Pacific Wood Products; www.buildgp.com
 - 2. Louisiana-Pacific Corporation; www.lpcorp.com
 - 3. RedBuilt Engineered Wood Products; www.redbuilt.com
 - 4. Roseburg Forest Products www.roseburg.com
 - 5. Web Joist Corporation; www.webjoist.com
 - 6. Weyerhaeuser – TrussJoist Engineered Wood Products; www.woodbywy.com

2.02 MATERIALS

- A. Wood I-Joists:
 - 1. Materials: Plywood web joists shall be factory manufactured with structural grade plywood, microlam or machine stress rated lumber flanges, utilizing waterproof type glues. Plywood webs shall be APA structural I grade with face veneers installed with grain running in the vertical direction of the joist and butt jointed to form a continuous web member. The web shall be pressure formed and fit into a groove in the center of the wide face of the flange members so as to form a pressured glue-joint at that junction.

2. Design: Joists shall be sized and detailed to fit the dimensions and loads indicated on the plans. Designs shall be in accordance with allowable values and section properties assigned and approved by the building code. Verification of design of the joist by complete calculations is to be available upon request.
3. Fabrication: Joists shall be manufactured in a plant approved by the building code for fabrication.

PART 3 EXECUTION

3.01 ERECTION

- A. Where shown on Drawings, wood I-joists and parallel strand lumber beams shall be erected in accordance with the drawings and fabricators installation suggestions. Temporary construction loads which cause member stresses beyond design limits are not permitted.
- B. Erection bracing and blocking in addition to that specified bridging is to be provided to keep the joists straight and plumb as required to assure adequate lateral support for the individual joists and the entire system until the sheathing material has been applied.
- C. Contractor shall notify the Architect prior to enclosing joists to provide the opportunity for inspection of the installation.
- D. Temporarily removing web members, drilling or cutting chords or webs will not be permitted without written permission from Architect.
- E. Coordinate with other trades whose Work relates to beam or joist member installation.

3.02 CLEANING

- A. After erection, remove unused materials, tools, scaffolding and debris and leave broom clean.

END OF SECTION

SECTION 06 18 00

GLUE-LAMINATED CONSTRUCTION

PART 1 GENERAL

1.01 SUBMITTALS

- A. Shop Drawings: Submit drawings showing materials, dimensions and erection details.

1.02 QUALITY ASSURANCE

- A. Standards: Design, fabrication and construction of structural glue-laminated timber shall conform to applicable requirements of the following:
 - 1. ANSI/AITC A190.1.
 - 2. CS-253.
- B. Laminator shall have minimum 5 years of continuous experience immediately prior to fabricating beams of this project.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Store members on supports not less than 12 inches above ground or 1-1/2 inches above subfloors, as applicable.
- B. Individually wrap members for protection during shipment, storage and erection with Sisalkraft or resin sized paper. Contractor shall continue to protect members after erection and until acceptance of Work.
- C. Protect members during unloading, hauling and erection. Field-trimmed ends or surfaces shall receive a coat of penetrating type sealer prior to erection.

1.04 PROJECT/SITE CONDITIONS

- A. Measurements: Verify dimensions shown on Drawings by taking field measurements; proper fit and attachment of members is required.

1.05 SCHEDULING

- A. Contractor and fabricator shall coordinate construction and delivery schedules. Members shall not be delivered to site until adequate preparation for storage has been made and not erected until preparations to receive members are complete, including miscellaneous metal and connecting hardware embedded in concrete.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Lumber:
 - 1. Lumber for laminating shall be of such stress grade to provide glue-laminated members with normal working stress values of 2400 p.s.i. in bending.
 - 2. Moisture Content: At time of gluing, moisture content of lumber shall not be less than 7 percent and shall not exceed 11 percent. The range of moisture content of various laminations assembled into a single member shall not exceed 5 percent.

- B. Adhesive:
 - 1. Mixing, spreading, storage life, pot life, working life and assembly life of adhesive shall be per manufacturer's recommendations. Use exterior type adhesives.
 - 2. Comply with ANSI/AITC A190.1 for wet-use (dry-use) adhesive.

2.02 FABRICATION

- A. Fabricate with adequate plant and equipment and under supervision of properly qualified personnel.
- B. Laminations shall be machine finished, but not sanded, to a smooth finish and to a uniform thickness with a maximum allowable variation of 1/64 inch.
- C. Provide members conforming to AITC Architectural appearance grade where exposed to view and Industrial appearance grade where concealed from view in the final construction in accordance with AITC-110.
- D. Warp, twist or other characteristics which prevent contact of adjacent glued faces or interfere with uniform bending when under clamping pressure not permitted. Surfaces to be glued shall be clean and free from oil, dust and other foreign material detrimental to gluing.
- E. Identification: Each completed member shall bear a specific identification, for location and shall be accompanied by an AITC Inspection Certificate provided by the fabricator.
- F. Connecting Hardware:
 - 1. Connecting hardware indicated on Drawings shall be furnished by fabricator of glue-laminated members.
 - 2. Steel plates, angles and other shapes: Conform to ASTM A36.
 - 3. Bolts: Conform to ASTM A307. Make bolt lengths such that threads are excluded from bearing on wood or steel. Provide standard malleable iron or equivalent steel plate washers under bolt heads or nuts bearing on wood.
 - 4. Lag screws, shear plates and split ring connectors: Conform to "National Design Specifications for Stress Grade Lumber and Its Fastenings" of National Forest Products Association.
 - 5. Accurately locate bolt holes and drill with a bit 1/16 inch larger in diameter than bolt. Install lag screws, shear plates and split ring connectors per National Design Specifications.
 - 6. Galvanizing: Fabricated steel base assemblies shall be by hot-dip process per ASTM A123 after fabrication.
 - 7. Shop paint: Coat connecting hardware except galvanized base, not embedded in concrete, with one coat of primer per Federal Specification TT-P-645.

PART 3 EXECUTION

3.01 ERECTION

- A. Erect members in accordance with AITC-105 and the instructions of the fabricator.
- B. Handling or erection of tools, equipment and methods shall avoid scarring corners and faces or otherwise injuring the member. Sharp instruments or unprotected wire rope or chain slings not permitted.

- C. Erect laminated wood members true and plumb. Install temporary bracing wherever necessary to take care of loads to which structure may be subjected, including erection equipment, and to keep structure and members in alignment.
- D. Leave temporary bracing in place as long as required for safety and until no longer required to maintain position. As erection progresses, securely bolt up to take care of dead loads, lateral forces and erection stresses. Tie temporary bracing to adequate support.

3.02 FIELD QUALITY CONTROL

- A. Inspection and Testing:
 - 1. Inspection of beams and their connections prior to erection and after erection, at the jobsite, shall be by an ICC certified independent inspector with minimum five (5) years of experience in inspecting glulam beams and their framing.
 - 2. Where, as cautioned by AITC, tension may occur perpendicular to grain due to wood shrinkage restrained by connection or other reasons, the laminator shall install vertical dowels in glued holes to arrest cracks.
 - 3. Size of dowels and the spacing shall be determined by the laminator for each specific occurrence, regardless of when such cracks occur.
 - 4. Tension lamination finger joints shall be proofload tested and test results submitted for review.

3.03 CLEANING

- A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 06 20 00

FINISH CARPENTRY

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Interior finish carpentry including, but not limited to:
 - 1. T & G ceiling boards and trim.
- B. Related Sections:
 - 1. Section 06 10 00 – Rough Carpentry, for backing panels, blocking, nailers and similar items.
 - 2. Section 06 40 00 – Architectural Woodwork, for installation of relocated cabinetry, including new end panels and trim as may be necessary; and plastic laminate faced wall shelving.

1.02 SUBMITTALS

- A. Samples: Submit two samples of each type and or species of exposed finish carpentry item required for Project. Samples shall be minimum 12 inch lengths of actual board, trim, etc.
- B. Woodwork Quality Standard Compliance Certificates: AWS Quality Certification Program Certificates.

1.03 REFERENCES

- A. Reference Standards: Following standards apply to Work of this Section except where more stringent requirements are specified:
 - 1. Architectural Woodwork Standards (AWS), Edition 1.

1.04 QUALITY ASSURANCE

- A. Quality Standard: Unless otherwise indicated, comply with AWS's "Architectural Woodwork Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.
 - 1. Standard of Quality: Premium Grade.
- B. T&G Decking Soffit/Ceiling Boards: Comply with AITC 112, "Standard for Tongue-and-Groove Heavy Timber Roof Decking."
- C. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum of 5 year documented experience, and approved by the Owner for Bidding.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

- B. Storage: Adequately protect against damage while stored at the site.

1.06 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 43 and 70 percent during the remainder of the construction period.

1.07 COORDINATION

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

PART 2 PRODUCTS

2.01 MATERIALS -GENERAL

- A. Provide materials that comply with requirements of AWS's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.

2.02 MATERIALS

- A. T&G Solid Wood Decking: Standard tongue-and-groove or double tongue-and-groove decking, solid wood or laminated as indicated on Drawings, of the following unit grade of the indicated pattern in the required species:
 - 1. Species and Grade: Clear VG (Vertical Grain) Heart Douglass Fir, or similar as approved by Architect; NLGA, WCLIB, or WWPA, or as otherwise indicated on Drawings.
 - 2. Pattern: V-edge, rough sawn tongue-and-groove pattern with eased edges, unless otherwise indicated on Drawings, actual face width (coverage) and thickness as indicated on Drawings, measured at 19 percent moisture content.
 - 3. Moisture Content: Provide wood decking fabricated from kiln-dried lumber of 19 percent moisture content complying with DOC PS 20, and include S-DRY or similar indication in grade marking or certification of grade.
- B. Lumber Trim: Select clear grade wood of same cut and species as T&G wood decking.
 - 1. Moisture Content: Provide wood decking fabricated from kiln-dried lumber of 19 percent moisture content complying with DOC PS 20, and include S-DRY or similar indication in grade marking or certification of grade.
 - 2. Provide standing and running trim of size and profile indicated on Drawings.
- C. Grounds, Blocking and Furring Strips: As specified in Section 06 10 00.
- D. Fasteners:
 - 1. Size and type: Nails, screws, and other anchoring devices of type, size, material, and finish required to suit application indicated to provide secure attachment, concealed where possible.
 - a. Where finish carpentry materials are exposed in areas of high humidity, provide fasteners and anchorages with hot-dip galvanized finish complying with ASTM A153.

- E. Multipurpose Construction Adhesive: Formulation complying with ASTM D3498 that is recommended for indicated use by adhesive manufacturer.
- F. Finishing Materials for Field Finished Carpentry: As specified in Section 09 91 00.

2.03 FABRICATION

- A. Fabrication shall be in accordance with applicable standard specified herein under "Quality Assurance," for grade of work specified.
- B. Shop assemble finish carpentry, when possible, for delivery to site in units easily handled and to permit passage through building openings.
- C. Shop prepare and identify components for matching during site erection.
- D. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.
- E. Wood Trim: Comply with applicable requirements of the AWI standard for the type of woodwork being fabricated, and the following:
 - 1. Provide wood trim members in longest lengths practical to minimize splices and in compliance with AWI requirements for grade indicated.
 - 2. Backout or groove backs of flat trim members and kerf backs of other wide, flat members. Terminate kerf or groove short of end of members with ends exposed in finished work.

2.04 SHOP FINISHING

- A. Shop finish interior carpentry indicated to receive transparent or stain finish to the greatest extent possible.
 - 1. Sand work smooth and set exposed nails and other fasteners.
 - 2. Apply wood filler in exposed nail and fastener indentations. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and types recommended for applied finishes.
 - 3. Finish work in the factory in accordance with AWI Manual, Section 1500 Water Reducible Acrylic Lacquer or Catalyzed Polyurethane finish systems, or as otherwise indicated on Interior Drawings and Specifications.
 - 4. Seal surfaces in contact with cementitious materials.
 - 5. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end-grain surfaces.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.02 PREPARATION

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

3.03 INSTALLATION

- A. Installation shall be in accordance with applicable standard specified herein under "Quality Assurance," for grade of work specified.
- B. Set and secure materials and components in place, plumb and level.
- C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.
- D. T&G Ceiling/Soffit Boards: Install T&G ceiling boards as shown on Drawings with end joints located over bearings as indicated and blind-nailed through tongue prior to attaching next board. Face nail and countersink final board and fill holes which will be exposed to view in the finished Work with matching wood filler, sanded smooth.
 - 1. Blind nail where feasible. Exposed finish nails shall be placed in creases where feasible; set for putty stopping in surfaced members.
- E. Wood Trim:
 - 1. Install members longest lengths practical to avoid end to end splices/joints.
 - 2. Miter external corners and cope internal corners.
 - 3. Where unavoidable in the finished Work, splices shall be cut at a 22.5 degree angle (not square butted).
 - 4. Stagger joints in adjacent and related members.
 - 5. Fasten with concealed fasteners to the greatest extent possible, except where exposed fastening is the indicated method of installation. When exposed fastening is indicated or required to complete installation.
 - a. Where blind nailing is not possible, drill pilot holes at locations best hidden in finished work.
 - b. Use only finish or casing nails. Set nails for putty stopping in surfaced members.
- F. Hammer marks are not acceptable on exposed finished surfaces and are subject to rejection of member by Architect.
- G. Tolerances: As follows:
 - 1. Plumb and level: 1/16 inch in 96-inches maximum.
 - 2. Vertical cup and bow for flush wood members: 1/16 inch in 96-inch maximum.
 - 3. Horizontal variation from true plane: 1/8 inch in 96-inches maximum.
 - 4. Alignment of reveals and joints between members: 1/32 inch maximum offset.
 - 5. Gaps between trim and Wall: 1/32 inch maximum.
- H. Complete the finishing work specified in this Section to the extent not completed at shop or before installation of woodwork. Fill nail holes with matching filler where exposed prior to finishing.

3.04 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 06 40 00

ARCHITECTURAL WOODWORK

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Architectural woodwork as shown on Drawings and as specified herein, including, but not limited to, the following:
 - 1. Installation of relocated existing plastic laminate faced cabinets and countertops as indicated on Drawings.
 - 2. Fabrication of new end panels, trim and other items as necessary for installation of relocated existing cabinets and countertops.
 - 3. Sub-tops for engineered quartz countertops specified in Section 06 61 16.
 - 4. Wall mounted adjustable plastic laminate shelving.
 - 5. Other items as indicated.
- B. Related Sections:
 - 1. Section 05 50 00 – Metal Fabrications, for steel countertop supports.
 - 2. Section 06 61 16 – Solid Surfacing Fabrications, for solid surfacing countertops.

1.02 SUBMITTALS

- A. Shop Drawings: Submit Drawings showing layout, elevations, dimensions, hardware, construction details, and schedule of finishes. Field verify critical dimensions.
- B. Samples: Submit three Samples of each specified or scheduled plastic laminate for verification purposes.

1.03 REFERENCES

- A. Reference Standards: Comply with the following:
 - 1. Architectural Woodwork Standards (AWS), Latest Edition.
 - 2. ANSI/NEMA LD3 for laminates.

1.04 QUALITY ASSURANCES

- A. Applicable Standard: Perform work in accordance with referenced standards and the following:
 - 1. Premium Grade, unless otherwise indicated.
- B. Qualifications: Manufacturer shall be company specializing in manufacturing the products specified in this Section with minimum 3 years documented experience, and approved by the Owner for Bidding.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.
- B. Storage: Adequately protect against damage and moisture while stored at the site.
- C. Handling: Comply with Manufacturer's instructions.

1.06 PROJECT CONDITIONS

- A. Environmental Requirements: Provide humidity conditions which will prevent damage to woodwork.
- B. Verify that field measurements are as indicated on Shop Drawings.

PART 2 PRODUCTS

2.01 MANUFACTURERS – HIGH PRESSURE DECORATIVE LAMINATE

- A. Furnish high pressure decorative laminate products of one of the following Manufacturers, except as approved by the Architect, subject to compliance with Specification requirements:
 - 1. Wilsonart www.wilsonart.com
 - 2. As otherwise scheduled on Drawings or approved by Architect.

2.02 MATERIALS

- A. Softwood Lumber (Concealed Locations): Graded in accordance with applicable standard specified herein under "Quality Assurance," for grade of work specified, Douglas Fir species, plain sawn, moisture content of 6-8 percent, with flat grain. Thickness as indicated on Drawings.
- B. Softwood Plywood: DOC PS 1, MDO (Medium Density Overlay), or other overlay plywood product suitable for application of plastic laminate as approved by the Architect.
- C. Thermofused Decorative Overlay (Melamine): Roseburg Thermally Fused Melamine Panels as manufactured by Roseburg Forest Products (800) 245-1115 www.rfpc.com.
 - 1. Substrate: Roseburg Ultrablend, Roseburg Pine Particleboard or Medium Density Fiberboard (MDF).
- D. Wood Particleboard: Standard in accordance with applicable standard specified herein under "Quality Assurance," for grade of work specified, composed of wood chips, 45 lb. density, made with water resistant adhesive; of grade to suit application; sanded faces for drawer construction and shelving.
- E. Medium Density Fiberboard (MDF): Medite II (or Medite FR as applicable) as manufactured by SierraPine, Roseville, CA, 800-676-3339 www.sierrapine.com, complying with the following:
 - 1. Fabricate from 90% pre-consumer wood residuals
 - 2. Fabricate without formaldehyde.
 - 3. Provide Medex in lieu of Medite II at all wet areas or within 2 feet of any sink or source of water.

2.03 LAMINATE MATERIALS

- A. Plastic Laminate: High pressure decorative type.
 - 1. Horizontal Grade: NEMA LD-3, Grade GP50, .050 inch thickness.
 - 2. Horizontal Grade (Color-Thru): NEMA LD-3, Grade GP50 with color extending through material thickness.
 - 3. Vertical Grade: NEMA LD-3, Grade GP28, (.028 inch thickness). This grade of laminate shall be counterbalanced.
 - 4. Post Forming Grade: NEMA LD-3, Grade PF 42.

5. Cabinet Liner Grade: NEMA LD-3, Grade CL-20, (.020 inch thickness). This grade of laminate shall be counterbalanced.
6. Backer: NEMA LD-3, Grade BK-20 (.020 inch thickness).
7. Finishes, Colors and Patterns: As scheduled on Drawings or as otherwise selected by Architect.

2.04 ACCESSORIES

- A. Laminate Adhesive: 3M Fastbond 30, or equivalent to suit application.
- B. Wall Adhesive: Cartridge type compatible with paneling and wall substrate.
- C. Edge Trim for Plastic Laminate Faced Casework: Doellken woodtape www.doellken-woodtape.com, No. 2367 Pebble color or as otherwise indicated on Drawings, or matching plastic laminate as indicated on Drawings.
- D. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application. Threaded steel for concealed joints.

2.05 HARDWARE

- A. Shelf Standard and Brackets: K&V 85-185 double-slot.
- B. Provide other hardware as necessary to fulfill function of architectural woodwork and cabinets as shown on Drawings, subject to approval by Architect.
- C. Finish: Match existing.

2.06 FABRICATION

- A. Fabricate architectural woodwork in conformance with Premium Grade Standards in accordance with applicable standard specified herein under "Quality Assurance."
- B. Exposed fasteners are not allowed in the finish Work on exposed and semi-exposed surfaces.
- C. Edges: Cap exposed edges of plastic laminate casework with matching plastic laminate. Use one piece for full length only.
- D. Shelves: Fabricate shelves with 3/4 inch minimum thick wood particleboard, MDF or plywood cores, unless otherwise indicated.
 1. Laminate: High pressure decorative laminate at all edges, unless otherwise indicated on Drawings.
- E. Fabricate new end panels, trim, etc. from 3/4 inch thick wood particleboard, MDF or plywood cores with plastic laminate finish to match existing relocated units.
- F. When necessary to cut and fit on site, provide materials with ample allowance for cutting and scribing to walls.
- G. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arrises. Locate counter butt joints minimum 2 feet from sink cut-outs.
- H. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

- A. Set and secure cabinetry and other woodwork in place; rigid, plumb and level, and in accordance with applicable standard specified herein under "Quality Assurance" for grade of work specified.
- B. Use fixture attachments in concealed locations for wall mounted components.
- C. Secure and align adjoining cabinet units and counter tops with concealed joint fasteners.
- D. Scribe casework abutting walls and other components, including walls with variable decorative finishes, with maximum gaps of 1/32 inch. Do not use trim or additional overlay trim for this purpose.
- E. Secure cabinet and bases to floor using appropriate angles and anchorages.
- F. Exposed fasteners are not allowed in the finish Work. Fasteners in concealed locations shall be countersink and concealed with plugs to match surrounding materials; finish flush with surrounding surfaces.
- G. Install trim in single lengths without splices where possible. Miter external corners and cope internal corners.

3.03 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 06 61 16

SOLID SURFACING FABRICATIONS

1.01 SUMMARY

- A. Section Includes: Solid polymer fabrications, as indicated on Drawings and as specified, including, but not limited to:
 - 1. Countertops including back and side splashes.
 - 2. Wall caps.
- B. Related Sections:
 - 1. Section 06400 – Architectural Woodwork, for subtops for solid polymer countertops.

1.02 SUBMITTALS

- A. Product Data: Indicate product description, fabrication information and compliance with specified performance requirements.
- B. Shop Drawings: Indicate dimensions, component sizes, edge details, fabrication details, locations and dimensions of cutouts, required locations of support and blocking members, attachment provisions and coordination requirements with adjacent work.
- C. Samples: Submit two (2), 6 inch x 6 inch samples of each color/finish of solid surfacing material required.
- D. Maintenance Data: Submit manufacturer's care and maintenance data, including repair and cleaning instructions.

1.03 QUALITY ASSURANCE

- A. Fabricator/Installer Qualifications:
 - 1. Certified or approved by the Manufacturer.
 - 2. Subject to approval by Architect.
 - 3. Have adequate physical facilities and sufficient production capacity to produce, transport, deliver, and install the required units without causing delay in the work.
 - 4. Have a minimum of 2 years of fabrication experience.
- B. Fire Test Response Characteristics: Provide materials 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 inspection agency acceptable to authorities having jurisdiction:
 - 1. Flame Spread: 25 or less.
 - 2. Smoke Developed Index: 450 or less.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver no components to project site until areas are ready for installation. Store indoors in a dry area and away from extreme temperatures.
- B. Deliver materials and accessory products in manufacturer's unopened containers.
- C. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.05 WARRANTY

- A. Provide manufacturer's ten year limited warranty against visible defects and failure due to manufacturing defects. Damage caused by physical or chemical abuse or damage from excessive heat is excluded from warranty. Warranty shall provide material and labor to repair or replace defective materials.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish solid surfacing materials of one of the following manufacturers as scheduled on Drawings by reference to manufacturer's proprietary colors and finishes, except as otherwise approved by the Architect, subject to compliance with Specification requirements.
 - 1. HI-MACS as manufactured by LG Hausys www.lghimacsusa.com
 - 2. As otherwise indicated on Drawings or approved by Architect.

2.02 MATERIALS

- A. Solid Surfacing Material: Manufacturer's proprietary formulation of fully densified composite of modified polymer resins and mineral fillers.
 - 1. UL Class 1 fire resistance rated.
 - 2. Basis of Design Color and Finish: As indicated on Drawings by reference to Manufacturer's proprietary color designations. Other specified manufacturer's solid surfacing material products having similar color and finish characteristics may be approved by Architect, subject to conformance with requirements.
 - 3. Thickness: As indicated on Drawings, fabricated from 1/2 inch thick material.
- B. Provide edge details of profiles shown on the Drawings.
- C. Provide backsplashes, where shown on the Drawings, to dimensions shown on the Drawings.
- D. Superficial damage to a depth of 0.010 inch (.25mm) to solid surfacing materials shall be repaired by sanding and/or polishing.

2.03 ACCESSORY PRODUCTS

- A. Joint Adhesive: Manufacturer's standard two-part adhesive kit to create inconspicuous, non-porous joints. Color to match fabrication material.
- B. Panel Adhesive: Manufacturer's standard neoprene-based panel adhesive meeting ANSI A136.1-1967 and UL(R) listed.
- C. Sealant:
 - 1. For conditions exposed to moisture; Manufacturer's standard mildew-resistant, FDA/UL(R) recognized silicone sealant in colors matching components.
 - 2. For conditions not exposed to moisture; Manufacturer's standard silicone sealant in colors matching polymer material.

2.04 FABRICATION

- A. Fabricate components to greatest extent practicable to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer's printed instructions and technical bulletins.
- B. Form joints between components using manufacturer's standard joint adhesive; without conspicuous joints. Reinforce joints with 2 inch strip of solid polymer material.
- C. Provide factory cutouts for plumbing fittings and bath accessories as indicated on the drawings. Coordinate with scheduled and specified plumbing fixtures and toilet room accessories.
- D. Cut, rout and finish component edges with clean, sharp returns. Rout radii and contours to template. Repair or reject defective and inaccurate work.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

- A. Install components plumb and level, scribed to adjacent finishes, in accordance with approved shop drawings and manufacturer's installation instructions.
- B. Provide materials in largest pieces available to minimize field joints.
- C. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work. Keep components and hands clean when making joints.
- D. Cut and finish component edges with clean, sharp returns. Rout radii and contours to template.
- E. Anchor securely to base cabinets or other supports as indicated.
- F. Align countertops and form seams to comply with manufacturer's printed recommendations using adhesive in color to match countertop.
- G. Install countertops with no more than 1/8 inch sag, bow or other variation from straight line.
- H. Provide backsplashes and sidesplashes as indicated on the drawings. Adhere to countertops using manufacturer's standard color-matched silicone sealant and panel adhesive.
- I. Carefully dress joints smooth, remove surface scratches and clean entire surface.

- J. Keep components and hands clean during installation. Remove adhesives, sealants and other stains. Keep clean until Date of Substantial Completion. Replace stained components.

3.03 PROTECTION

- A. Protect surfaces from damage until Date of Substantial Completion. Repair work or replace damaged work that cannot be repaired to Architect's satisfaction.

3.04 CLEANING

- A. During the course of the Work and on completion of the Work, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 07 21 00

BUILDING INSULATION

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes the following:
 - 1. Batt/Blanket thermal building insulation.
 - 2. Fire-safing insulation.
- B. Related Sections:
 - 1. Section 07 51 13 – Built-Up Asphalt Roofing, for rigid roof insulation installed as part of built-up roof assembly.
 - 2. Section 07 84 00 – Firestopping.

1.02 SUBMITTALS

- A. Product Data: Submit Manufacturer's data, installation instructions, limitations and recommendations. Include certification and test data substantiating R-Values and combustibility of each type of insulation.

1.03 QUALITY ASSURANCE

- A. Regulatory Requirements: Conform to applicable code for fire resistance ratings and surface burning characteristics.
- B. Provide certificate of compliance acceptable to authorities having jurisdiction indicating conformance to fire-resistance requirements.
- C. Fire safing insulation and assemblies for closure of various voids with fire safing insulation shall comply with CBC Chapter 7 requirements.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Delivery and Storage: Deliver materials to job in Manufacturer's original unopened packaging. Adequately protect against damage while stored at the site. Deliver so that stocks of materials on the site will permit uninterrupted progress of the Work.
- B. Materials shall be properly identified on each package with the Manufacturer's name and R value.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the following Manufacturers, except as approved otherwise by the Architect, subject to compliance with Specification requirements:
 - 1. Batt and Semi-Rigid Batt Insulation:
 - a. Johns-Manville www.jm.com
 - b. Owens-Corning Fiberglas Corp. www.owenscorning.com
 - c. Certainteed www.certainteed.com
 - d. Knauf Insulation www.knaufinsulation.com

2. Fire Safing Insulation:
 - a. Thermafiber, Inc. www.thermafiber.com
 - b. Roxul Inc. www.roxul.com

B. Materials designated for a specific application shall be the products of one Manufacturer.

2.02 MATERIALS

- A. Batt Insulation:
 1. Unfaced Glass Fiber Batts: ASTM C665, Type I, unfaced glass fiber batts.
 2. Metal Building Insulation: Energy Saver FP system as manufactured by Guardian Building Products Distribution, Inc.; fiberglass blanket insulation conforming to ASTM C991, Type I (unfaced) and ASTM E136, or equivalent as approved by Architect.
 - a. Fabric Facing: Energy Saver FP Fabric as manufactured by Guardian Building Products Distribution, Inc.; woven reinforced high-density polyethylene yarns coated on both sides with a continuous white polyethylene film, flame-spread and smoke-developed indices of 5 and 20, respectively when tested in accordance with ASTM E84, or equivalent as approved by Architect.
 - b. Installation Accessories: Provide manufacturer's standard adhesive, self-drilling fasteners, and banding clips as required for indicated installation.
 3. Provide batts manufactured from mineral fiber where used within walls with cement backer board applied to one or both sides.
 4. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indices of 25 and 50, respectively when tested in accordance with ASTM E84.
 5. Thickness: Provide minimum thickness as indicated on Drawings for various locations, or minimum thickness to provide the resistance values indicated on Drawings, for various locations. Batts shall be a single thickness to meet the required R value, multiple layers of batts will not be accepted.
- B. Fire Safing Insulation: ASTM C24, E119 and E136, with 4 pcf density. Thickness shall be as required by the Manufacturer to provide a fire rating equal to that of the assembly of which it is a part. Where smoke stop protection also is required, install firestopping sealant complying with Section 07 84 00 as needed to meet UL Standard 1479 and ASTM E814 procedure.
- C. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.
- D. Spindle Anchors, Washers and Shields: Provide copper coated low carbon steel spindles, angled type where required for attachment of curtain wall insulation, with steel insulation retainer plates, washers and shields that are listed and labeled for use, and approved by curtain wall insulation Manufacturer for use in curtain wall fire containment assembly. Protect ends of spindles with capped self-locking washers where exposed to contact.
 1. Acceptable Products:
 - a. Stic-Klip Mfg. Co., Type A or B as necessary, with Type S adhesive
 - b. Miracle Adhesive Corp. "Miracle StukUps" with Type HT994 adhesive.
 - c. Goodloe E. Moore Gemco Gemco or Tuff-Weld with G-P Improved or Tuff-Bond Quik-Set Type Adhesive as applicable.
- E. Safing Clips: Galvanized steel safing clips approved by Manufacturer of safing insulation for holding safing insulation in place.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

- A. Batt Insulation:
 - 1. Apply no insulation until such time as the Construction has progressed to the point that inclement weather will not damage or wet the insulation material.
 - 2. Fully insulate small areas between closely spaced framing members, pipes, conduits or other obstruction by cutting and fitting insulation material as required to maintain the integrity of the insulation.
 - 3. Installation of insulation of scheduled thickness/R-value is required at all exterior walls, soffits, projections, etc., whether indicated on Drawings or not.
 - 4. Batt insulation at metal studs and other non-nailable members/substrates shall be installed continuously tight against framing members.
 - a. Secure in place with string wire or other method as approved by Architect.
 - 5. Cut insulation 1/2-inch wider than gap to be filled to ensure compression fit.
 - 6. Leave no voids in completed installation.
 - 7. Place insulation tight to exterior wall or roof substrate without voids.
 - 8. End match neatly with ends fitting snugly.
 - 9. Do not cover recessed light fixtures with insulation. Cut out insulation to provide 6 inch minimum clearance around recessed light fixtures.
- B. Metal Building Insulation: Install insulation in accordance with manufacturer's published detailed Roof System Installation Instructions, as follows:
 - 1. Install longitudinal bands within each purlin space.
 - 2. Pull banding tight to tops of endwall rafters using banding clips and fasteners. Do not fasten longitudinal bands to any intermediate rafters.
 - 3. Install series of cross bands 60 inches on center threaded above every fifth or sixth longitudinal band. Fasten and position bands in accordance with manufacturer's detailed instructions.
 - 4. Position Energy Saver support fabric and pull fabric beneath purlins in accordance with manufacturer's detailed instructions. Temporarily clamp fabric in-place prior to final attachment to allow square and smooth fabric in position.
 - 5. After fabric is smooth, install single fastener and banding clip through each support band and the fabric into the bottom of the eave strut. Proceed with fastening in accordance with manufacturer's detailed instructions.
 - 6. Notch fabric around purlins.
 - 7. Seal fabric to top of rafter with brush adhesive in accordance with manufacturer's detailed instructions.
 - 8. Install fiberglass installation in accordance with manufacturer's detailed instructions.
- C. Fire Safing Insulation: Install in proper sizes on safing clips as needed but not to exceed 24 inches O.C. Leave no voids between walls and edges of slabs.
 - 1. Install safing clips where required to support insulation as required by Code.

2. Cut safig insulation 1/2-inch wider than gap to be filled to ensure compression fit. Seal joint between insulation and edge of slab and curtain wall insulation and between lengths of insulation with calking approved by safig insulation Manufacturer for this purpose. Leave no voids in completed installation.

3.03 CLEANING

- A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition.
- B. Protection: Take precautions to protect insulation, both during and after installation, from damage of any kind until covered.

END OF SECTION

SECTION 07 24 00

EXTERIOR INSULATION AND FINISH SYSTEM

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes Class PB exterior insulation and finish system (EIFS), consisting of an adhesive, expanded polystyrene insulation board, base coat, reinforcing mesh(es) and finish as follows:
 - 1. System applied over exterior gypsum sheathing over steel stud framing.
 - 2. System mechanically attached over existing exterior metal wall panels.
 - 3. EIFS finish applied to 2-coat portland cement plaster specified in Section 09 24 00 installed over CMU walls.

1.02 DEFINITIONS

- A. Base Coat: Material used to encapsulate one or more layers of reinforcing mesh fully embedded that is applied to the outside surface of the EPS.
- B. Building Expansion Joint: A joint through the entire building structure designed to accommodate structural movement.
- C. Expansion Joint: A structural discontinuity in the Exterior Insulation and Finish System (EIFS).
- D. Finish: An acrylic-based coating, available in a variety of textures and colors that is applied over the base coat.
- E. Insulation Board: Expanded polystyrene (EPS) insulation board, which is affixed to the substrate and creates a layer of continuous insulation.
- F. Reinforcing Mesh: Glass fiber mesh(es) used to reinforce the base coat and to provide impact resistance.
- G. Sheathing: A substrate in sheet form.
- H. Substrate: The material to which the EIFS is affixed.
- I. Substrate System: The total wall assembly including the attached substrate to which the EIFS is affixed.

1.03 SYSTEM DESCRIPTION

- A. General: Exterior Insulation and Finish System, Class PB, consisting of an adhesive, expanded polystyrene insulation board, base coat, reinforcing mesh(es) and finish. Mechanically attached systems shall conform to Dryvit specification DS135.
- B. Methods of Installation - EIFS:
 - 1. Field Applied: The EIFS is applied to the substrate system in place.

- C. Design Requirements:
1. Acceptable substrates for the EIFS shall be:
 - a. Exterior sheathing having a water-resistant core with fiberglass mat facers meeting ASTM C1177.
 - b. Cement plaster, concrete, or masonry.
 2. Deflection of substrate systems shall not exceed 1/240 times the span.
 3. The substrate shall be flat within 1/4 inch in a 4 ft. radius.
 4. The slope of inclined surfaces shall not be less than 6 in 12 (27 degrees), and the length shall not exceed 12 inches.
 5. Expansion Joints:
 - a. Design and location of expansion joints in the EIFS is the responsibility of the project designer and shall be noted on the project drawings. As a minimum, expansion joints shall be placed at the following locations:
 - 1) Where expansion joints occur in the substrate system.
 - 2) Where building expansion joints occur.
 - 3) At floor lines in wood frame construction.
 - 4) At floor lines of non-wood framed buildings where significant movement is expected.
 - 5) Where the EIFS abuts dissimilar materials.
 - 6) Where the substrate type changes
 - 7) Where prefabricated panels abut one another
 - 8) In continuous elevations at intervals not exceeding 75 feet.
 - 9) Where significant structural movement occurs such as changes in roofline, building shape or structural system.
 6. Terminations:
 - a. Prior to applying the EIFS, wall openings shall be treated with Dryvit AquaFlash System or Flashing Tape. Refer to Dryvit Outsulation System Installation Details, DS107.
 - b. The EIFS shall be held back from adjoining materials around openings and penetrations such as windows, doors and mechanical equipment a minimum of 3/4 inch for sealant application. See Dryvit's Outsulation System Installation Details, DS107.
 - c. The system shall be terminated a minimum of 8 inches above finished grade.
 - d. Sealants.
 - 1) Shall be manufactured and supplied by others.
 - 2) Shall be compatible with EIFS materials. Refer to current Dryvit Publication DS153 for listing of sealants tested by sealant manufacturer for compatibility.
 - 3) The sealant backer rod shall be of closed cell.
 7. Flashing: Shall be provided at all roof-wall intersections, windows, doors, and other areas as necessary to prevent water from entering behind the EIFS.
- D. Performance Requirements:
1. The EIFS shall have been tested as follows:
 - a. Durability

TEST	TEST METHOD	CRITERIA	RESULTS
Abrasion Resistance	ASTM D 968	No deleterious effects after 500 liters (528 quarts)	No deleterious effects after 1000 liters (1056 quarts)
Accelerated Weathering	ASTM G 155 Cycle 1	No deleterious effects after 2000 hours	No deleterious effects after 5000 hours
	ASTM G 154 Cycle 1 (QUV)		No deleterious effects after 5000 hours

TEST	TEST METHOD	CRITERIA	RESULTS
Freeze-Thaw	ASTM E 2485 (formerly EIMA 101.01)	No deleterious effects after 60 cycles	Passed - No deleterious effects after 90 cycles
	ASTM C 67 modified	No deleterious effects after 60 cycles	Passed - No deleterious effects after 60 cycles
	ASTM E 2485/ICC-ES Proc.; ICC ES (AC219)***	No deleterious effects after 10 cycles	Passed - No deleterious effects after 10 cycles
Mildew Resistance	ASTM D 3273	No growth during 28 day exposure period	No growth during 60 day exposure period
Water Resistance	ASTM D 2247	No deleterious effects after 14 days exposure	No deleterious effects after 42 days exposure
Taber Abrasion	ASTM D 4060	N/A	Passed 1000 cycles
Salt Spray Resistance	ASTM B 117	No deleterious effects after 300 hours exposure	No deleterious effects after 1000 hours exposure
Water Penetration	ASTM E 331 ICC ES (AC 219)***	No water penetration beyond the inner-most plane of the wall after 2 hours at 299 Pa (6.24 psf)	Passed 2 hours at 299 Pa (6.24 psf)
Water Vapor Transmission	ASTM E 96 Procedure B	Vapor permeable	EPS 5 perm-inch Base Coat* 40 Perms Finish** 40 Perms
* Base Coat perm value based on Dryvit Genesis® ** Finish perm value based on Dryvit Quarzputz *** AC 219 – Acceptance Criteria for EIFS			

b. Structural:

TEST	TEST METHOD	CRITERIA	RESULTS
Tensile Bond	ASTM C 297/E 2134	Minimum 104 kPa (15 psi) – substrate or insulation failure	Minimum 132 kPa (19.1 psi)
Transverse Wind Load	ASTM E 330	Withstand positive and negative wind loads as specified by the building code	Minimum 4.3 kPa (90 psf)* 16 inch o.c. framing, ½ in sheathing screw attached at 203 mm (8 inch) o.c.
* All Dryvit components remain intact – for higher wind loads contact Dryvit Systems, Inc.			

c. Impact Resistance: In accordance with ASTM E 2486 (formerly EIMA Standard 101.86).

Reinforcing Mesh ¹ /Weight g/m ² (oz/yd ²)	Minimum Tensile Strengths	EIMA Impact Classification	EIMA Impact Range Joules (in-lbs)		Impact Test Results Joules (in-lbs)	
Standard - 146 (4.3)	27 g/cm (150 lbs/in)	Standard	3-6	(25-49)	4	(36)
Standard Plus - 203 (6)	36 g/cm (200 lbs/in)	Medium	6-10	(50-89)	6	(56)
Intermediate™ - 407 (12)	54 g/cm (300 lbs/in)	High	10-17	(90-150)	12	(108)

Reinforcing Mesh ¹ /Weight g/m ² (oz/yd ²)	Minimum Tensile Strengths	EIMA Impact Classification	EIMA Impact Range Joules (in-lbs)		Impact Test Results Joules (in-lbs)	
Panzer® 15 * - 509 (15)	71 g/cm (400 lbs/in)	Ultra High	>17	(>150)	18	(162)
Panzer 20 * - 695 (20.5)	98 g/cm (550 lbs/in)	Ultra High	>17	(>150)	40	(352)
Detail® Short Rolls - 146 (4.3)	27 g/cm (150 lbs/in)	n/a	n/a	n/a	n/a	n/a
Corner Mesh™ - 244 (7.2)	49 g/cm (274 lbs/in)	n/a	n/a	n/a	n/a	n/a
*Shall be used in conjunction with Standard Mesh (recommended for areas exposed to high traffic) 1. It shall be colored blue and bear the Dryvit logo for product identification.						

d. Fire performance:

TEST	TEST METHOD	CRITERIA	RESULTS
Fire Resistance	ASTM E 119	No effect on the fire resistance of a rated wall assembly	Passed 1 hour Passed 2 hour
Ignitability	NFPA 268	No ignition at 12.5 kw/m ² at 20 minutes	Passed
Full Scale Multi-Story Fire Test	UBC Std. 26-4 (formerly 17-6)	1. Resist vertical spread of flame within the core of the panel from one story to the next 2. Resist flame propagation over the exterior surface 3. Resist spread of vertical flame over the interior surface from one story to the next 4. Resist significant lateral spread of flame from the compartment of fire origin to adjacent spaces	Passed
Intermediate Multi-Story Fire Test	NFPA 285 (UBC 26-9)	1. Resist flame propagation over the exterior surface 2. Resist vertical spread of flame within combustible core/component of panel from one story to the next 3. Resist vertical spread of flame over the interior surface from one story to the next 4. Resist lateral spread of flame from the compartment of fire origin to adjacent spaces	Passed
Full Scale Multi-Story* (corner test)	ANSI FM 4880	Resist flame propagation over the exterior surface.	Passed; No height restrictions*
* Dryvit FM products must be specified			

2. The EIFS components shall be tested for:
a. Fire:

TEST	TEST METHOD	CRITERIA	RESULTS
Surface Burning Characteristics	ASTM E 84	All components shall have a: Flame Spread $\leq$ 25 Smoke Developed $\leq$ 450	Passed

- b. Durability:

TEST	TEST METHOD	CRITERIA	RESULTS
Reinforcing Mesh Alkali Resistance of Reinforcing Mesh	ASTM E 2098 (formerly EIMA 105.01)	> 21dN/cm (120 pli) retained tensile strength after exposure	Passed
EPS (Physical Properties)	ASTM C 303, D 1622	15.2-20.0 kg/m ³ (0.95-1.25 lb/ft ³)	Pass
Density	ASTM C 177, C 518		Pass
Thermal Resistance	ASTM C 272	4.0 @ 4.4 °C (40 °F)	Pass
	ASTM D 2863	3.6 @ 23.9 °C (75 °F)	Pass
Water Absorption	ASTM D 1621 Proc. A	2.5 % max. by volume	Pass
Oxygen Index	ASTM C 203	24% min. by volume	Pass
Compressive Strength	ASTM E 84	69 kPa (10 psi) min.	Pass
Flexural Strength		172 kPa (25 psi) min.	Pass
Flame Spread		25 max.	Pass
Smoke Developed		450 max.	Pass

1.04 SUBMITTALS

- A. Product Data: Provide data on secondary weather barrier design material, product characteristics, performance criteria, limitations and durability.
- B. Shop Drawings: Indicate wall joint pattern and joint details, thickness, and installation details.
- C. Samples: Provide color and texture sample for Architect's approval. Sample shall be 24 x 24 inches mounted on gypsum sheathing (of the type which will be actually used), of each finish, texture and color. Each sample shall be prepared using the same tools and techniques proposed for the actual installation.
- D. Certificates: Submit a copy of applicator's current certificate of approval from EIFS manufacturer for this Project.

1.05 QUALITY ASSURANCE

- A. Qualifications:
1. System Manufacturer: All materials shall be manufactured or sold by the specified manufacturer and shall be purchased from the manufacturer or its authorized distributors.

2. Contractor: Shall be knowledgeable in the proper installation of the exterior insulation and finish systems specified and shall be experienced and competent in the installation of Exterior Insulation and Finish Systems. Additionally, the contractor shall possess a current Trained Contractor Certificate issued by the manufacturer.
 3. Insulation Board Manufacturer: Shall be listed by the EIFS manufacturer, shall be capable of producing the Expanded Polystyrene (EPS) in accordance with current EIFS manufacturer Specification for Insulation Board, and shall subscribe to manufacturer's Third Party Certification and Quality Assurance Program.
- B. Regulatory Requirements:
1. The EPS shall be separated from the interior of the building by a minimum 15-minute thermal barrier.
 2. The use and maximum thickness of EPS shall be in accordance with the applicable building codes.
- C. Certification:
1. EIFS shall be recognized for the intended use by the applicable building code(s).
- D. Mock-Up:
1. The contractor shall, before the project commences, provide the owner/architect with a mock-up for approval.
 2. The mock-up shall be of suitable size as required to accurately represent the products being installed, as well as each color and texture to be utilized on the project.
 3. The mock-up shall be prepared with the same products, tools, equipment and techniques required for the actual application. The finish used shall be from the same batch that is being used on the project.
 4. The approved mock-up shall be available and maintained at the job site.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in manufacturer's original unopened packaging with labels intact.
- B. Upon arrival, materials shall be inspected for physical damage, freezing, or overheating. Questionable materials shall not be used.
1. Materials shall be stored at the jobsite in a cool, dry location, out of direct sunlight, protected from weather and other sources of damage, at manufacturer's recommended minimum storage temperature for type of finish specified.
 2. Maximum storage temperature shall not exceed 100 deg. F. Minimize exposure to temperatures above 90 deg. F. Never expose to temperatures above 110 deg. F.
- C. Protect all products from inclement weather and direct sunlight.
- D. Handling: Comply with manufacturer's instructions.

1.07 PROJECT/SITE CONDITIONS

- A. Environmental Requirements:
1. Application of wet materials shall not take place during inclement weather unless appropriate protection is provided. Protect materials from inclement weather until they are completely dry.
 2. At the time of application, the minimum air and wall surface temperatures shall be 40 deg. F.

3. These temperatures shall be maintained with adequate air ventilation and circulation for a minimum of 24 hours thereafter, or until the products are completely dry. Refer to published product data sheets for more specific information.

- B. Existing Conditions - The contractor shall have access to electric power, clean water, and a clean work area at the location where the EIFS materials are to be applied.

1.08 SEQUENCE AND SCHEDULING

- A. Installation of the EIFS shall be coordinated with other construction trades.
- B. Sufficient manpower and equipment shall be employed to ensure a continuous operation, free of cold joints, scaffold lines, texture variations, etc.

1.09 WARRANTY

- A. Provide manufacturer's Complete 10 year warranty covering both labor and materials used in system, and substrate.

1.10 EXTRA MATERIALS

- A. Furnish the following maintenance materials:
 1. For each finish and color, one can of finish.
 2. One can of adhesive.
 3. 20 square feet of standard reinforcing mesh.
 4. 20 square feet of insulation board.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. Furnish products of the following manufacturer (No Substitutions Allowed):
 1. Dryvit System, Inc., West Warwick, RI www.dryvit.com
- B. Basis of Design: Dryvit Outsulation System Exterior Insulation and Finish System.

2.02 MATERIALS

- A. Portland Cement: Shall be Type I or II, meeting ASTM C150, white or gray in color, fresh and free of lumps.
- B. Water: Shall be clean and free of foreign matter.
- C. Mechanical Fasteners (mechanically attached over existing exterior metal wall panels in accordance with DS135): As follows, or equivalent, used in conjunction with corrosion resistant fasteners appropriate for the substrate system, complying with the following:
 1. Fasteners: Minimum No. 8 Screw with Silver Senti coating or equivalent.
 2. Plastic Washers - Minimum 1-1/2 inch plastic washers specifically designed for use with Exterior Insulation and Finish Systems. Approved Plastic Washers:
 - a. Wind-lock Corporation: Wind Devil 2™ or Wind Devil®.
 - b. ITW Buildex: Grid Mate™ PB.

2.03 COMPONENTS

- A. Flashing Materials: Used to protect substrate edges at terminations.
 - 1. Liquid Applied: An extremely flexible water-based polymer material, ready for use.
 - a. Shall be AquaFlash and AquaFlash Mesh
 - 2. Sheet Type: Shall be Flashing Tape and Surface Conditioner
 - a. Dryvit Flashing Tape™: A high density polyethylene film backed with a rubberized asphalt adhesive available in rolls 4 inch, 6 inch, and 9 inch wide by 75 feet long.
 - b. Dryvit Flashing Tape Surface Conditioner™: A water-based surface conditioner and adhesion promoter for the Dryvit Flashing Tape.
- B. Adhesives: Used to adhere the EPS to the substrate, shall be compatible with the substrate and the EPS.
 - 1. Cementitious: A liquid polymer-based material, which is field mixed with Portland cement for use over non wood-based substrates.
 - a. Primus®, or as otherwise recommended by the manufacturer.
 - 2. Ready mixed: A dry blend cementitious, copolymer-based product, field mixed with water for use over non wood-based substrates.
 - a. Primus® DM, or as otherwise recommended by the manufacturer.
 - 3. Noncementitious: A factory-mixed, fully formulated water-based adhesive for use over wood-based substrates.
 - a. ADEPS®, or as otherwise recommended by the manufacturer.
- C. Insulation Board: Expanded polystyrene meeting Dryvit Specification for Insulation Board, DS131.
 - 1. Thickness of insulation board shall be 1-1/2 inches and shall be maintained at all locations, unless otherwise indicated on Drawings.
 - 2. The insulation board shall be manufactured by a board supplier listed by Dryvit Systems, Inc.
- D. Base Coat: Shall be compatible with the EPS insulation board and reinforcing mesh(es).
 - 1. Cementitious: A liquid polymer-based material, which is field mixed with Portland cement.
 - a. Primus.
 - b. Provide Genesis where used to spot fasteners of mechanically attached insulation board.
 - 2. Ready mixed: A dry blend cementitious, copolymer-based product, field mixed with water.
 - a. Primus DM, or as otherwise recommended by the manufacturer.
- E. Reinforcing Mesh: A balanced open weave, glass fiber fabric treated for compatibility with other system materials.
 - 1. Shall be Standard, Intermediate, Detail and Corner Mesh.
- F. Finish: Shall be the type, color and texture as selected by the architect/owner and shall be one or more of the following:
 - 1. Standard DPR (Dirt Pickup Resistance): Water-based, acrylic coating with integral color and texture and formulated with DPR chemistry:
 - a. Sandblast® DPR: Medium texture.
 - 2. Coatings, Primers and Sealers:
 - a. Demandit.
 - b. Color Prime or Color Prime-W.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Prior to installation of the Exterior Insulation and Finish System, Contractor shall verify that the substrate:
 - 1. Is of a type listed in Section 1.03.C.1, or as otherwise approved by manufacturer.
 - 2. Is flat within 1/4 inch in 4 foot radius.
 - 3. Is sound, dry, connections are tight, has no surface voids, projections or other conditions that may interfere with the EIFS installation or performance.
- B. Prior to the installation of the EIFS, contractor shall insure that all needed flashings and other waterproofing details have been completed, if such completion is required prior to the EIFS application. Additionally, the Contractor shall ensure that:
 - 1. Metal roof flashing has been installed in accordance with Asphalt Roofing Manufacturers Association (ARMA) Standards.
 - 2. Openings are flashed in accordance with the Outsulation System Installation Details, DS107, or as otherwise necessary to prevent water penetration.
 - 3. Windows, Doors, etc. are installed and flashed per manufacturer's requirements and the Outsulation System Installation Details, DS107.
- C. Prior to the installation of the EIFS, the contractor shall notify the general contractor, and/or architect, and/or owner of all discrepancies.

3.02 PREPARATION

- A. The EIFS materials shall be protected by permanent or temporary means from inclement weather and other sources of damage prior to, during, and following application until completely dry.
- B. Protect adjoining work and property during EIFS installation.
- C. The substrate shall be prepared as to be free of foreign materials, such as, oil, dust, dirt, form release agents, efflorescence, paint, wax, water repellants, moisture, frost and any other condition that inhibit adhesion.

3.03 MIXING

- A. Preparation of all EIFS materials shall be done in accordance with the Outsulation Application Instructions, DS204, or the applicable product literature.

3.04 INSTALLATION

- A. Installation – General: The system shall be installed in accordance with the current Dryvit Outsulation System Application Instructions, DS204.
- B. Installation over exterior gypsum sheathing over steel stud framing:
 - 1. Rasp the surface of the insulation board to remove any irregularities
 - 2. The overall minimum base coat thickness shall be sufficient to fully embed the mesh. The recommended method is to apply the base coat in two (2) passes.
 - 3. Sealant shall not be applied directly to textured finishes or base coat surfaces. EIFS base coat surfaces in contact with sealant shall be coated with Demandit or Color Prime.
 - 4. When installing the EIFS, the notched trowel method of adhesive application shall be used over gypsum sheathing substrates.

5. Finish Application:
 - a. Allow reinforced base coat to cure a minimum of 24 hours prior to installation of Finish.
 - b. Install DPR finish selected in accordance with Dryvit specification DS416.
- C. Installation mechanically attached over existing exterior metal wall panels:
 1. Mechanically attach insulation and install system in accordance with the current Dryvit Outsulation System Application Instructions DS135.
 2. Insulation board shall be attached to the substrate horizontally with vertical joints staggered and butted tightly.
 3. Install mechanical fasteners with approved plastic washers flush with the surface of the insulation board and not to exceed 1/16 inch below the surface.
 - a. Fastener Pattern: Comply with Dryvit specification DS135 Fastening Pattern "A".
 4. Rasp the surface of the insulation board to remove any irregularities.
 5. Base Coat Application:
 - a. Spot the fasteners with the Genesis mixture.
 - b. Let prespotted areas take-up and either install a full Genesis or Primus base coat over the entire wall surface.
 6. Finish Application:
 - a. Allow reinforced base coat to cure a minimum of 24 hours prior to installation of Finish.
 - b. Install DPR finish selected in accordance with Dryvit specification DS416.
- D. Installation of EIFS finish over 2-coat portland cement plaster specified in Section 09 24 00 installed over CMU walls:
 1. Allow 2-coat Portland cement plaster specified in Section 09 24 00 to cure prior to application of EIFS finish.
 2. Apply Color Prime or Color Prime-W over cured brown coat.
 3. Finish Application: Install DPR finish selected in accordance with Dryvit specification DS416.
- E. High impact meshes shall be installed as specified at ground level to 4'-0" above grade as indicated on Drawings or otherwise selected by Architect.
- F. Provide drip groove where EIFS returns horizontally per manufacturer's recommendations.

3.05 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: During construction the work shall be inspected by the EIFS manufacturer or authorized representative.
- B. EIFS Special Inspections: Installation of EIFS shall be inspected during construction as required by Section 1704 of the IBC.
 1. Provide free access to Work and cooperate with appointed firm.
 2. Inspections shall be performed by a representative of a qualified independent special inspector acceptable to the Owner and meeting qualification requirements.
 3. Inspector shall prepare reports indicating that work inspected was done in conformance to approved Construction Documents.
 4. Discrepancies shall be immediately corrected by the Contractor.
 5. Completed work which does not conform to approved Construction Documents shall be reported to the Architect.
 6. Work completed that does not comply with approved Construction Documents shall be rejected.

3.05 CLEANING AND PROTECTION

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.
- B. Completed EIFS shall be protected from inclement weather and other sources of damage until dry and permanent protection in the form of flashings, sealants, etc. are installed.

END OF SECTION

SECTION 07 51 13

BUILT-UP ROOFING

PART 1 - GENERAL

1.01 SCOPE OF WORK SUMMARY

- A. Section includes the following:
 - 1. Insulation and Coverboard
 - 2. Hot Applied Base and Ply Felts
 - 3. White Aggregate in Cold Applied Flood Coat
 - 4. Furnish all materials and labor needed to complete the specified built-up roof system. See part 2 for material list and part 3 for installation details. Refer to manufacturer published installation guidelines for coverage rates and application procedures if additional information is required.
 - 5. Furnish and install CSPE flashing membrane on all vertical surfaces as baseflashing membrane.
 - 6. Installation of roofing in two phases.
 - 7. Roofing Manufacturer to provide a 15-year QA warranty.

1.02 DEFINITIONS

- A. Roofing Terminology: Refer to ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.

1.03 SUBMITTALS FOR REVIEW

- A. Product Data: Provide manufacturer's technical product data for each type of roofing product specified. Include data substantiating that materials comply with specified requirements.
- B. MSDS: Provide manufacturer's MSDS for each product and all chemicals that will be on site during the project.
- C. Tapered Insulation System Design: Provide a tapered insulation design/layout CAD drawing. Drawing should identify slope, thickness at mechanical equipment, and penetrations, and all perimeter edges and parapet walls. Architect must approve tapered system design.
- D. Specimen Manufacturer's Warranty: Provide an unexecuted copy of the warranty specified for this project, indentifying the terms and conditions required of the Manufacturer and the Owner.
- E. Specimen Contractor's Warranty: Provide an unexecuted copy of the warranty specified for this project, indentifying the terms and conditions required of the Contractor and the Owner.

1.04 PERFORMANCE REQUIREMENTS

- A. General: Provide installed roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.

- B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.

1.05 CONTRACTORS

- A. Roofing Contractor must be prior approved by Owner and must be an approved applicator certified by the Basis of Design Manufacturer Specified in Part II of this specification. The following Contractors are approved by owner:
 - 1. Progressive Roofing, Inc. Phoenix, Arizona, Phone: 602-278-4900
 - 2. Classic Roofing, Inc., Phoenix Arizona, Phone: 602-442-5550
 - 3. Star Roofing, Phoenix, Arizona, Phone: 602-944-3323

1.06 QUALITY ASSURANCE

The qualified firm that is approved, authorized, or licensed by the building owner and the roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's warranty.

- A. Manufacturer's Technical Representative Qualifications: An authorized full-time employee representative of manufacturer experienced in the installation and maintenance of the specified roofing system and qualified to determine Installer's compliance with the requirements of this Project.
- B. Source Limitations: Obtain components for roofing system from or approved by roofing system manufacturer.
- C. Fire-Test-Response Characteristics: Provide roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, FMG, or another testing and inspecting agency acceptable to authorities having jurisdiction. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.
 - 1. Exterior Fire Test Exposure: Class A; ASTM E 108, for application and roof slopes indicated.
- D. Preinstallation Conference: Conduct conference at Project site. Comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to roofing system including, but not limited to, the following:
 - 1. Meet with Owner, Owner's Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.
 - 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 - 3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Examine substrate conditions and finishes for compliance with requirements, including flatness and fastening.
 - 5. Review structural loading limitations of roof deck during and after roofing.
 - 6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
 - 7. Review governing regulations and requirements for insurance and certificates if applicable.
 - 8. Review temporary protection requirements for roofing system during and after installation.
 - 9. Review roof observation and repair procedures after roofing installation.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storage.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
 - 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturers written instructions for handling, storing, and protecting during installation. All materials must be covered with tarps and protected from dew, rain or other moisture at all times prior to installation.
- D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.08 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.
- B. Existing Roof Removal: Do not tear-off roofing if rain is likely. Only remove existing roofing membrane in sections that can be covered with new roofing before the end of each workday. Building must be left in a watertight condition at the end of each workday.

1.09 WARRANTY

- A. Warranty: Manufacturer's Warranty and Service Agreement in which manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.
- B. New Roof Component Coverage: A single manufacturer shall provide specified warranty. The warranty must not contain renewals to reach the end of the warranty. The manufacturer's warranty must include labor and material coverage against leakage on all components including those manufactured by others. Included in the warranty coverage are the following:
 - 1. Warranty must include roofing membrane, base flashings, roofing membrane accessories, roof insulation, all sheet metal-related details, and termination details.
 - 2. Roof Inspections and Housekeeping: The System Manufacturer shall provide roof inspection and housekeeping during years 2, 5, & 10 during the warranty period.
 - a. General rooftop housekeeping and clean up, subject to limits, but generally including removal of incidental debris.
 - b. Inspection by a Technical Representative and delivery of a written inspection report documenting roof conditions.
 - c. Reports will be available on a web bases database accessible by the building owner.
 - d. Inspection reports to be accessible on a web-based database.

3. Warranty Period: 15-years from date of Substantial Completion.
- C. Contractor Project Warranty: Submit roofing Installer's warranty, signed by Installer, covering Work of this Section, including all components of roofing system such as roofing membrane, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, roof pavers, and walkway products, for the following warranty period:
 1. Warranty Period: Two (2) Years

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Basis-of-Design Manufacturer/Product: The roof system specified in this section is based upon Tremco, Inc. products named in other Part 2 articles. The "Basis of Design" materials, manufacturers' products designations, and/or manufacturer's names specified herein shall be regarded as the minimum standard for quality required for work of this Section. Comply with all manufacturer and contractor/fabricator quality and performance criteria specified in Part 1.
 1. Hot Applied Built-up Membrane Roofing:
 - a. Tremco Incorporated, Cleveland, OH 216-292-5000 / 520-240-5690

2.02 ROOFING MEMBRANE SHEETS

- A. Base Sheet: Basis of design product: Tremco, BURmastic Composite Ply: Nonperforated, asphalt-coated, polyester/fiberglass/polyester reinforced sheet dusted with fine mineral surfacing on both sides which meets the requirements of ASTM D 4601, Type II, and the following properties:
 1. Breaking Strength, minimum, ASTM D 146: machine direction, 130 lbf/in (22.5 kN/m); cross machine direction, 120 lbf/in (21.0 kN/m).
 2. Tear Strength, minimum, ASTM D 4073: machine direction, 200 lbf (880 N); cross machine direction, 200 lbf (880 N).
 3. Pliability, 1/2-inch (12.7 mm) radius bend, ASTM D 146: No failures.
 4. Thickness, minimum, ASTM D 146: 0.050 inch (1.3 mm).
 5. Weight, minimum, ASTM D 228: 30 lb/100 sq. ft. (1.45 kg/sq. m.).
 6. Mass of desaturated polyester/glass/polyester mat, ASTM D 228: 2.0 lb/100 sq. ft. (0.95 g/sq. m.).
 7. Asphalt, minimum, ASTM D 228: 10 lb/100 sq. ft. (488 g/sq. m.).
- B. Ply Sheet: Basis of design product: Tremco, THERMglass Type IV: ASTM D 2178, Type IV, asphalt-impregnated, glass-fiber felt
 1. Three (3) Plies.

2.03 SURFACING MATERIALS

- A. Solvent-Free Cold-Applied Adhesive: Basis of design product: Tremco, ECOLastic: Water-based, asbestos-free, low-VOC, cold-applied restorative top pour and aggregate adhesive specially formulated for compatibility with asphalt and coal tar roofing membranes and flashings, with the following physical properties:
 1. Asbestos Content, ASTM D 276: None.
 2. Volatile Organic Compounds (VOC), maximum, ASTM D 3960: 75 g/L.

3. Density at 77 deg. F (25 deg. C), ASTM D 6511: 8.6 lb/gal (1.03 kg/L).
4. Coverage Rate: 5 gallons per 100 sq. ft.

- B. Surfacing Aggregate: Tremco/A-1 Grit Snow White Marble Roofing Aggregate, a highly reflective aggregate, kiln dried, durable roof surfacing material.
1. Size: 3/8" (#4)
 2. Available in 7/8 cubic foot bags, which is approx. 80 lb. with 35 bags per pallet.
 3. Hardness, 5.0 Mohs
 4. Specific Gravity, 2.75
 5. Color, White
 6. Coverage Rate: 450 lbs per 100 sq. ft.

2.04 BASE FLASHING SHEETS

- A. Flashing Sheet: Basis of design product: Tremco, Hypalon Elastomeric Sheeting: ASTM D 5019, Type I, Grade II, CSPE sheet with the following physical properties:
1. Breaking Strength, minimum, ASTM D 751: 225 lbf (1000 N).
 2. Tear Resistance: ASTM D 751: 90 lbf (400 N).
 3. Elongation at Fabric Break, minimum, ASTM D 751: 25 percent.
 4. Low Temperature Flexibility: ASTM D 2136: -40 deg. F (-40 deg. C).
 5. Thickness, minimum, ASTM D 751: 0.040 inch (1.0 mm).
 6. Color: White
- B. Base Flashing Bonding Adhesive: Tremco, Sheeting Bond: One-part, asbestos-free, cold-applied, butyl rubber-based, elastomeric trowel-grade adhesive specially formulated for compatibility and use with specified roofing membranes and flashings, with the following properties:
1. Adhesion in Peel, minimum, ASTM D 1876: 3 lbf/in (0.5 N/mm).
 2. Lap Shear Adhesion, minimum, ASTM D 816: 18 psi (124 kPa).
 3. Asbestos Content: ASTM D 276: None.
 4. Volatile Organic Compounds (VOC), maximum, ASTM D 3960: 250 g/L.
 5. Color: White

2.05 HOT-APPLIED ASPHALT MATERIALS

- A. Roofing Asphalt: Basis of design product: Trumbull, Type IV: ASTM D 312, Type IV, hot-melt asphalt, with the following physical properties:
1. Softening Point, min/max, ASTM D 36: 215-225 deg F (102-107 deg C).
 2. Penetration at 77 deg. F (25 deg. C), min/max, ASTM D 5: 15-30 dmm.
 3. Flash point, minimum, ASTM D 92: 525 deg F (274 deg C).
 4. Ductility at 77 deg. F (25 deg. C), minimum, ASTM D 113: 2.5 cm.

2.06 BASEFLASHING COATING MATERIAL

- A. Acrylic Coating Primer: Basis of design product: Tremco, Tremco SP Primer: Asbestos-free, acrylic-based primer formulated for use with acrylic latex coatings, with the following physical properties:
1. Asbestos Content, EPA 600 R-93/116: None.
 2. Non-volatile Content (by weight), minimum, ASTM D 1644: 32 percent.
 3. Percent Solids (by volume), minimum, ASTM D 5201: 31 percent.
 4. Volatile Organic Compounds (VOC), maximum, ASTM D 3960: 115 g/L.

- B. White Roof Coating: Basis of design product: Tremco, ICE Coating: Water-based, Energy Star Certified, CRRC certified, elastomeric roof coating formulated for use on bituminous roof surfaces, with the following physical properties:
1. Density @ 77 degree F, 110 – 117 ku, ASTM D1475-98
 2. Viscosity @ 77 degree F, 8.28 lbs/gal, ASTM D2196-99
 3. Nonvolatile content, 60.1% (by weight), ASTM D1644-88
 4. Percent Solids, 60.1% (by Volume), ASTM D5201-97
 5. Reflectance, 86%, ASTM C1549-04
 6. Emissivity, .93, ASTM C1370-04a
 7. Solar Reflectance Index (SRI), 108
 8. Asbestos Content, EPA/600/R-93/116: None.
 9. VOC, 35g/L, ASTM D3960-98

2.07 ASPHALT MATERIALS

- A. Low-VOC Asphalt Primer (metal primer): Basis of design product: Tremco, TREMprime LV: ASTM D 41, low-VOC, solvent-based asphalt primer with the following physical properties:
1. Asbestos Content, EPA 600 R-93/116: None.
 2. Non-Volatile Content, minimum, ASTM D 1644: 60 percent.
 3. Volatile Organic Compounds, maximum, ASTM D 3960: 350 g/L.
 4. Flash Point, minimum, ASTM D 3278: 100 deg. F (38 deg. C).
- B. Water-Based Asphalt Primer: Basis of design product: Tremco, Improved Tremprime WB: Water-based, polymer modified, asphalt primer with the following physical properties:
1. Asbestos Content, EPA 600/R13/116: None.
 2. Non-Volatile Content, minimum, ASTM D 2823: 32 percent.
 3. Volatile Organic Compounds (VOC), maximum, ASTM D 3960: 65 g/L.

2.08 ROOF MASTIC

- A. Asphalt Roofing Mastic (Seal curb corners, pitch pans, 3 course laps): Tremco, ELS: ASTM D 4586, Type II, Class 1, one-part, asbestos-free, cold-applied mastic specially formulated for compatibility and use with specified roofing membranes and flashings, with the following properties:
1. Asbestos Content, EPA 600/R13/116: None.
 2. Nonvolatile Matter, minimum, ASTM D 4586: 80 percent.
 3. Density at 77 deg F (25 deg C), ASTM D 1475: 9.3 lb/gal (1.11 kg/L).
- B. Elastomeric Roofing Mastic (Strip-in of base flashings): Tremco, POLYroof LV: One-part, asbestos-free, trowel-grade, elastomeric roof mastic specially formulated for compatibility and use with specified roofing membranes and flashings, with the following properties:
1. Asbestos Content, EPA 600/R13/116: None.
 2. Volatile Organic Compounds (VOC), maximum, ASTM D 3960: 300 g/L.
 3. Nonvolatile Matter, minimum, ASTM D 4586: 70 percent.
 4. Elongation at 77 deg. F (25 deg. C), minimum, ASTM D 412: 1000 percent.
 5. Recovery from 500% Elongation, minimum, ASTM D 412: 500 percent.
 6. Flexibility at -40 deg. F (-40 deg. C), ASTM D 3111: No Cracking.

2.09 AUXILIARY ROOFING MEMBRANE MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing membrane.

- B. Blocking: Alternative wood-lumber material manufactured from recycled and reclaimed plastic and waste wood materials as manufactured by Trex Company.
- C. Caulking: Polyurethane Sealant: Tremco Inc., TremSEAL D, One component Polyurethane Sealant Polyisobutylene, plain or modified bitumen, nonhardening, nonmigrating, nonskinning, and nondrying.
- D. 3-course reinforcement: Tremco BURMesh
- E. Metal Flashing Sheet: Metal flashing sheet is specified in Division 7 Section "Sheet Metal Flashing and Trim."
- F. Miscellaneous Accessories: Provide miscellaneous accessories recommended by roofing system manufacturer.

2.10 SHEET METAL

- A. Concealed Sheet metal flashings: 24 ga 0.635 mm galvanized steel. Meet requirements of ASTM A 653, for 1.25 oz commercial.
- B. Exposed Sheet metal flashing and parapet wall coping metal
 - 1. Finish:
 - a. Metal exposed to view shall have face coating of polyvinylidene Fluoride (PVF₂) Resin-base finish (Kynar 500 or Hylar 5000) containing 70 percent minimum PVF₂ in resin portion of formula. Thermo-cured two coat system consisting of corrosion inhibiting epoxy primer and topcoat factory applied over properly pre-treated metal. Reverse side coating shall be thermo-cured system consisting of corrosion inhibiting epoxy primer applied over properly pre-treated metal.
 - b. Color as selected by Owner Manufacturer's standard colors.
 - c. All Sheet metal must meet the following standard: 24 ga. 0.635 mm

2.11 ROOF INSULATION / COVERBOARD

- A. General: Provide preformed roof insulation boards that comply with requirements and referenced standards, selected from manufacturer's standard sizes and of thicknesses indicated.
- B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2, HCFC-free, with felt or glass-fiber mat facer on both major surfaces.
 - 1. Thickness: 3 inches
 - 2. LTTR-Value: 18.5
 - 3. Thickness greater than 2 inches must be installed in two or more layers
 - 4. When fully adhered - Board Size: 4' X 4'
 - 5. When Mechanically Attached: 4' X 8'
- C. Cover Board / Wood fiberboard: Temple Fiber Base HD: ASTM C 208, Type II, Grade 2, Cellulosic-fiber and water-resistant binders, asphalt coated on six sides and chemically treated for deterioration.
 - 1. Thickness: 1/2"
 - 2. Size: 4' X 8'

- D. Full Tapered Roof Insulation System: (Building 82)
 - 1. Tapered Polyiso Tapered Roof Insulation System
 - 2. See Drawing for Slope requirement's
 - 3. No minimum R-Value
- E. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where needed:
 - 1. As indicated on drawings
 - 2. As needed to create positive drainage and eliminate pounding water conditions
 - 3. At high side of all mechanical equipment curbs to prevent ponding water

2.12 INSULATION & COVERBOARD ADHEISIVE

- A. Roofing Asphalt: Basis of design product: Trumbull, Type IV: ASTM D 312, Type IV, hot-melt asphalt, with the following physical properties:
 - 1. Softening Point, min/max, ASTM D 36: 215-225 deg F (102-107 deg C).
 - 2. Penetration at 77 deg. F (25 deg. C), min/max, ASTM D 5: 15-30 dmm.
 - 3. Flash point, minimum, ASTM D 92: 525 deg F (274 deg C).
 - 4. Ductility at 77 deg. F (25 deg. C), minimum, ASTM D 113: 2.5 cm.

2.13 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatible with membrane roofing.
- B. Insulation Fasteners: Factory-coated steel fasteners and metal plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roofing membrane components to substrate, tested by manufacturer for required pullout strength, and acceptable to roofing system manufacturer.
- C. Insulation Cant Strips: ASTM C 208, Type II, Grade 1, cellulosic-fiber insulation board.
- D. Tapered Edge Strips: ASTM C 208, Type II, Grade 1, cellulosic-fiber insulation board.

PART 3 - EXECUTION

3.01 EXISTING ROOF DEMOLITION

- A. Removal of Roofing Materials: Remove all existing roofing materials including but not limited to foam roofing, built up roofing membrane, insulation, and flashings down to substrate as identified on project drawings:
 - 1. Clean foam and excess bituminous materials from all vertical surface.
 - 2. Manual methods such as axes, hatchets, knives, spud bars, pry bars, and shovels as well as saws are acceptable.
 - 3. Power slicer or power plow are acceptable
 - 4. Dust must be kept to a minimum.
- B. Properly Dispose of existing roof materials:
 - 1. Roof Demolition must be hauled to and legally deposited at an appropriate landfill that accepts roofing demolition debris.

- C. Fasteners securing existing roof system materials to metal substrate must be completely backed out and removed.
- D. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions.
 - 1. Remove sharp projections.

3.02 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:
 - 1. Verify that roof openings and penetrations are in place and set and braced and that roof drains are securely clamped in place.
 - 2. Verify that the top of roof curbs are at an acceptable height to accommodate the minimum base flashing height of 8 inches on all 4 sides of the unit and that the height will allow for cricket installation at the high side of the unit. Curb should be tall enough to allow for 8 inch clearance above the surface of the roof at high point of crickets and tapered insulation.
 - 3. Verify that wood cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
 - a. Furnish and install treated wood nailers to match thickness of Polyisocyanurate rigid insulation, tapered insulation, and wood fiberboard where installed.
 - b. Securely anchor nailers to deck using appropriate mechanical fasteners as recommended by system manufacturer.
 - 4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.03 INSTALLATION, GENERAL

- A. Install roofing system in accordance with manufacturer's requirements for specified warranty.
 - 1. Project specification and other project documents including detail drawings are minimum standards. Where manufacturers' requirements for warranty exceed project requirements, specifications, or details, the more stringent standard must apply.
 - 2. Roofing Contractor is responsible for meeting manufacturers' requirements to obtain specified warranty.
- B. Roofing system shall be installed in a two phased installation as follow:
 - 1. Roofing Contractor shall coordinate with General Contractor the partial tear-off and dry-in of the existing metal deck roof sections.
 - 2. Install rigid roof insulation and cover-board as specified.
 - 3. Install specified base sheet membrane as specified.
 - 4. Use specified mastic and reinforcement fabric to seal all penetrations.
 - 5. Tear-off and/or installation of insulation on new and existing areas, cover-board, and base sheet along with sealing penetrations with specified mastic shall be completed as phase 1 of roof construction.
 - 6. General Contractor and his sub-contractors shall coordinate with roofing manufacturer's technical representative or roofing contractor all new penetrations through base sheet installation. Care should be taken to avoid damage to base sheet installation. Plywood or other protective measures shall be provided to protect the base sheet application from heavy foot traffic and third party damage.

7. Once new curbs, parapet walls, other penetrations affecting the roof have been completed, General Contractor shall coordinate with the roofing contractor the start of the second phase of the roofing installation.
8. Prior to starting completion of the roofing system or phase two of roof construction, Roofing Contractor shall inspect the surface of the roof with a Tremco, Inc. technical roof advisor. Any defects in the base sheet installation must be corrected prior to installation of the ply felts. All punctures, holes, or 3rd party damage to base sheet surface must be repaired using specified base sheet membrane.
9. Voids in insulation created by curb installation must be filled and base sheet installed as per specification at all newly installed curbs and parapet walls.
10. Surface of Base Sheet must be clean, dry and free of defect prior to starting the installation of ply felts.
11. Roofing Contractor shall complete the roof system as specified.
12. Roofing Contractor shall assume a two-phase installation. Start project, leave project, and return to project. Phase 1 dry-in. Phase 2 completion of all roof sections.

3.04 METAL DECKS: INSULATION / COVERBOARD INSTALLATION

- A. Comply with roofing system manufacturer's written instructions for installing roof insulation.
 1. Specified Insulation to be installed in 2 layers. 1st layer to be mechanically attached. 2nd layer to be fully adhered in hot asphalt.
 2. Total Insulation Thickness: 3"
 3. LTTR-Value: 18.5
- B. Mechanically Fastened 1ST Layer of Rigid Insulation Board: Install insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding ¼ inch with insulation:
 1. Install specified rigid roof insulation over metal deck using mechanical fasteners.
 2. #14 Screws designed for deck type
 3. 3" round Steel TriRib Insulation Plates
 4. Fasten insulation to roof deck using 15 fasteners per 4' X 8' board.
 5. Use mechanical fasteners specifically designed and sized for fastening board-type roof insulation to deck type.
 6. Base Layer Thickness: 1.5 inch
- C. Adhere 2nd Layer of Rigid Insulation Board:
 1. Install specified rigid roof insulation over 1st layer of mechanical attached rigid insulation board.
 2. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.
 3. Install Polyisocyanurate rigid insulation board in full and continuous application of hot asphalt.
 4. Hot adhesives rely on temperature for their adhesion:
 - a. See EVT listed on Asphalt carton label for EVT.
 - b. Coverage rate: 25 lbs. per 100 sq. ft.
 5. 2nd Layer Thickness: 1.5 inch
- D. Coverboard: Adhere Coverboard in Hot Asphalt with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch (6 mm) with insulation.
 1. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.
 2. Install specified coverboard insulation board in full and continuous application of hot asphalt.
 3. Hot adhesives rely on temperature for their adhesion:

4. See EVT listed on Asphalt carton label for EVT.
 5. Coverage rate: 25 lbs. per 100 sq. ft.
 6. Thickness: ½ inch
- E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- F. Wood Nailers: Wood nailers must be installed to the appropriate height for the specified insulation.
1. See Tremco installation guidelines for installation requirements for wood nailers at pitch pans and other penetrations.
- G. Insulation Cant Strips: Install and secure preformed 45-degree insulation cant strips at junctures of built-up roofing membrane system with vertical surfaces or angle changes greater than 45 degrees.

3.05 WOOD DECK: TAPERED INSULATION AND COVERBOARD

- A. Full taper system over wood deck using screws and plates. Subsequent layers of tapered insulation to be installed in hot asphalt.
1. Contractor shall follow approved taper design provided to architect in submittal package.
 2. Fill gaps exceeding ¼ inch with insulation:
 3. Fasten base layer of taper system to roof deck using 15 fasteners per 4' X 8' board or equivalent.
 4. Use mechanical fasteners specifically designed and sized for fastening board-type roof insulation to deck type.
 5. Install subsequent layers of tapered insulation boards in hot asphalt
 6. Hot adhesives rely on temperature for their adhesion:
 7. See EVT listed on Asphalt carton label for EVT.
 8. Coverage rate: 25 lbs. per 100 sq. ft.
- B. Coverboard: Adhere Coverboard in Hot Asphalt with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch (6 mm) with insulation.
1. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.
 2. Install coverboard over tapered insulation in full and continuous application of hot asphalt.
 3. Hot adhesives rely on temperature for their adhesion:
 4. See EVT listed on Asphalt carton label for EVT and coverage rate.
 5. Thickness: ½ inch

3.06 ROOFING MEMBRANE INSTALLATION, GENERAL

- A. Install roofing membrane system according to roofing system manufacturer's written instructions and applicable recommendations of ARMA/NRCA's "Quality Control Guidelines for the Application of Built up Bitumen Roofing."
- B. Start installation of roofing membrane in presence of roofing system manufacturer's technical personnel.

- C. Coordinate installing roofing system so insulation and other components of the roofing membrane system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.
 - 1. Provide tie-offs at end of each day's work to cover exposed roofing membrane sheets and insulation with a course of coated felt set in roofing cement with joints and edges sealed.
 - 2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.
 - 3. Remove and discard temporary seals before beginning work on adjoining roofing.
- D. Substrate-Joint Penetrations: Prevent roofing asphalt from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

3.07 BASE SHEET INSTALLATION

- A. Install one lapped course of specified base sheet, extending sheet over and terminating beyond eaves. Attach base sheet as follows:
 - 1. Unroll roofing membrane sheets and allow them to relax
 - 2. Adhere to substrate in a solid mopping of hot roofing asphalt at a rate of 25 lbs/100 sq ft.
 - 3. Always broom in base sheet and plies immediately to expel entrapped gas and to ensure contact with hot adhesive.
 - 4. Correct Fishmouths and other defects as soon as surface is cool.
 - 5. Do not adjust off line roll - Cut and reset

3.08 BITUMINOUS ROOFING PLY FELT INSTALLATION

- A. Install Three (3) ply sheets starting at low point of roofing system. Align ply sheets without stretching. Extend ply sheets over and terminate beyond eaves.
 - 1. Embed each ply sheet in a solid mopping of hot roofing asphalt applied at rate required by roofing system manufacturer, to form a uniform membrane without ply sheets touching.
 - 2. Recommended application rate: 25 lbs per 100 sq. ft. per ply layer as interply adhesive.
 - 3. Leave no dry laps
 - 4. Always broom in plies immediately to expel entrapped gas and to ensure contact with hot adhesive.
 - 5. Corrections of fishmouths should be completed as soon as surface is cool.
 - 6. Do not adjust off line roll – cut and reset.

3.09 ROOF SURFACING INSTALLATION

- A. Apply the Solvent Free Cold Adhesive Flood Coat (Tremco EcoLastic) over all roof surfaces followed by a full covering of white aggregate:
 - 1. All Dirt, dust, and loose debris must be removed from the roof surface and the surface must be clean, sound, and dry.
 - 2. Apply Solvent Free ECOlastic Top Pour over newly installed ply felts at a rate of 5 - gal/100 sq.ft.
 - 3. Immediately broadcast 450 lb per 100 sq. ft. of new, clean, white aggregate into adhesive.

3.10 FLASHING AND STRIPPING INSTALLATION

- A. Install base flashing over cant strips and other sloping and vertical surfaces, at roof edges, and at penetrations through roof, and secure to substrates according to roofing system manufacturer's written instructions and as follows:
 - 1. Prime substrates with asphalt primer if required by roofing system manufacturer.
 - 2. Flashing Sheet Application: Adhere flashing sheet to substrate in cold-applied adhesive at rate required by roofing system manufacturer.
 - 3. Apply Tremco Sheeting Bond in a uniform and continuous application 1.6mm or 1/16" thick to prepared area. Leave Sheeting Bond exposed 15 minutes minimum before membrane application. Adjust open time depending on ambient conditions.
 - 4. Adhere Hypalon Elastomeric sheeting in Sheeting Bond without wrinkles or voids. Using a steel hand roller, apply consistent pressure to achieve full adhesion of the sheet to the flashing substrate. Sheeting must fully conform to all angle changes, with no bridging or voids.
 - 5. Strip in vertical overlaps seams and base of flashing to roof system with BURmesh reinforcing fabric embedded in a base course of Sheeting Bond and covered with a top course of Polyroof LV.
 - 6. All baseflashings (Hypalon) and Sheet metal counterflashings must be primed using Tremco SP Primer and coated white using Tremco ICE Coating
- B. Edge Flashings:
 - 1. Install a gravel stop at all roof edge locations
 - a. Grave; stop lip should not be less than 5/8" or greater than 1 inch.
 - 2. Install a face mounted continuous mounting cleat if the face of gravel stop exceeds 3 inches. Clip Gravel stop over cleat and mechanically attach the gravel stop to the roof deck.
 - 3. Apply a bed of mastic at the termination, and then install the metal flange, allowing sufficient room for expansion between each fascia section of gravel stop and stagger fasteners 6" on center using appropriate mechanical attachment.
 - 4. Mount joint covers into a bed of mastic and cover the gaps between the fascia gravel stop sections. Prime the metal flange with Tremprime LV or WB, then strip in the metal flange as specified in detail drawings
- C. Roof to Wall: Extend base flashing up walls a minimum of 8 inches (200 mm) above roofing membrane and 4 inches (100 mm) onto field of roofing membrane.
 - 1. Adhere base flashing membrane to walls using Tremco Sheeting Bond.
 - 2. Install new surface mount counterflashings.
- D. Parapet Walls: Wrap specified baseflashing membrane up and over parapet walls and mechanically attach on outside of wood nailer.
 - 1. If wall height exceeds 4' install a mechanically attached termination bar to support wall membrane. See manufactures guidelines for details.
 - 2. Adhere base flashing membrane to walls using Tremco Sheeting Bond.
- E. Mechanically fasten top of base flashing securely at terminations and perimeter of roofing.
 - 1. Apply termination bar fastened 6 inches on center. A water block should be sandwiched between the membrane and the wall substraight attached by the termination bar.
 - 2. A counter flashing is required over the termination bar.
 - 3. Lap Adhesive may be used as contact adhesive to bond CSPE lap seams.
 - 4. All corners, laps, seams, etc. must be securely adhered to a watertight condition.

- F. Scuppers: If and where needed, custom fabricate and install new scuppers at each scupper location.
 - 1. Install scuppers according to roofing system manufacturer's written instructions.

3.11 SHEET METAL INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
- B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in SMACNA's "Architectural Sheet Metal Manual" and as indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch (75-mm) centers.
- C. Custom fabrication (where needed only): The contractor shall be responsible for custom fabrication of metal edging and coping metals that will conform to required details on this project. Where custom fabrication is required, design of detail metals such as drip edge, edge metal, copings, wall flashings, counter flashings, etc. must be approved by manufacturers Technical Representative.
 - 1. Written detail approval should be obtained prior to custom fabrication and installation.
 - 2. Custom fabricate pitch pans and pitch pan tops. Base of pitch pans must be 4lb lead.

3.12 BLOCKING

- A. Roofing contractor is responsible for providing new Trex blocking under all gas lines, water lines, and condensation lines.
 - 1. Blocking should be installed every 6' under water lines, gas lines, and condensation lines.
 - 2. A membrane protection pad must be installed under each 4" X 4" Trex block to protect the roof.
 - 3. The Protection Pad should be attached to the base of the Trex blocking.
 - 4. Trex blocking attachment must not penetrate the BUR Membrane

Manufacturer's Technical Representative: a qualified manufacturer's technical representative will perform regular inspections visiting site and physically walking and inspecting the installation of the roof a minimum of 2 days per week. The Manufacturer's Technical Representative must spend time on site each week inspecting and observing roofing membrane installation and to prepare inspection reports that will be provided to the owner.

- B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Owner.
 - 1. Notify Owner 48 hours in advance of date and time of inspection.
- C. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.
- D. Additional inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.13 PROTECTING AND CLEANING

- A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

SECTION 07 60 00

FLASHING AND SHEET METAL

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Flashings, sheet metal work and related items including, but not limited to:
 - 1. Counterflashing at vertical surfaces.
 - 2. Flashing at roof penetrations.
 - 3. Scuppers, gutter and downspouts.
 - 4. Metal copings.
 - 5. Other items as indicated.
- B. Related Sections:
 - 1. Section 07 61 00 – Sheet Metal Roofing, for flashing and sheet metal associated with sheet metal roofing systems, including soffit and fascia panels and trim.

1.02 SUBMITTALS

- A. Shop Drawings: Submit Drawings indicating type of material, gauge, dimensions, profiles, locations where used, fastening and anchoring methods, joints, and provisions of expansion and contraction.
- B. Samples: Submit samples of each type of prefinished metal in selected color.

1.03 QUALITY ASSURANCE

- A. Standards:
 - 1. Comply with design and installation methods of SMACNA Architectural Sheet Metal Manual.
 - 2. Comply with The NRCA Roofing and Waterproofing Manual installation details.
 - 3. Comply with ANSI/SPRI, ES I-98.
- B. Performance Requirements: Designed and installed to withstand wind pressures in compliance with ANSI/SPRI, ES I-98, or FMG Loss Prevention Data Sheet 1-49 for Class 1-90 wind rated design, or wind load design criteria indicated on General Structural notes on Drawings, whichever is greater.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.
- B. Storage: Adequately protect against damage while stored at the site. Do not store materials on ground.
- C. Handling: Comply with Manufacturer's instructions. Handle with care so as not to buckle or warp metal, or damage solder joints.

1.05 WARRANTY

- A. Furnish 5 year warranty against flashing and sheet metal failure, in which contractor agrees to repair or replace flashing and sheet metal as necessary to maintain work in watertight condition during the warranty period. Warranty to cover workmanship, materials and repair or replacement of same, at no cost to Owner.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Prefinished Metal:
 - 1. Hot-dipped galvanized, ASTM A653 Structural Quality, Grade 40, G90 coating 24 gauge core steel, or prefinished Galvalume - ASTM A792.
 - 2. Aluminum Sheet: ASTM B 209, Alloy 3003, 3004, 3105, or 5005, Temper suitable for forming and structural performance required, but not less than H14.
 - 3. Finish: Full strength Kynar 500/Hylar 5000 Fluorocarbon coating, applied by the Manufacturer on a continuous coil coating line, with 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.
 - a. Bottom side: Coated with primer with a dry film thickness of 0.25 mil.
 - b. Finish: Conform to all tests for adhesion flexibility, and longevity as specified by the Kynar 500 finish supplier.
 - c. Color: As selected by Architect to match sheet metal roofing color specified in Section 07 61 00.
 - 4. Strippable film: Liquid applied to top side of painted coil to protect finish during fabrication, shipping and field handling.
- B. Galvanized Steel: ASTM A653, 24 gauge minimum and as indicated, with G-60 coating. Used for sheet metal flashing and trim at concealed from view locations and concealed clips and reinforcements only.
- C. Galvanized Steel Pipe (Downspouts): ASTM A53, Type E or S, Grade B (Fy = 35 ksi) with hot-dipped galvanized coating (G-90).

2.02 ACCESSORIES

- A. Reglets and Counterflashings: Fry Reglet Corporation, Type STX at stucco, Type SM at masonry and Concrete, or fabricated as indicated on Drawings. Provide prefabricated inside and outside reglet and counterflashing corners.
- B. Solder: ASTM B32, 50/50 type.
- C. Flux: FS O-F-506.
- D. Sealant: As specified in Section 07 92 00.
- E. Plastic Cement: ASTM D4586.
- F. Bituminous Coating: FS TT-C-494 or SSPC paint - 12, dry film 15 mils per coat.
- G. Sheet Metal Fasteners: Galvanized steel with soft neoprene washers at exposed fasteners. Where exposed in the finished work of prefinished metal, provide fasteners with prefinished heads matching prefinished metal.

- H. Prefinished Metal Seam Sealers and Adhesives: As recommended by prefinished metal manufacturer for waterproof and weather-resistant seaming and adhesive applications of flashing and sheet metal work.
 - 1. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, non-sag, nontoxic, nonstaining tape.
 - 2. Butyl Sealant: ASTM C1311, single-compound, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type expansion joints with limited movement.

2.03 FABRICATION

- A. Fabricate Flashing and sheet metal from the following:
 - 1. Fabricate flashing and sheet metal exposed to view in the finished work, including wall caps/coping), fascia, drip edges, etc., from prefinished metal sheet.
 - 2. Fabricate flashing and sheet metal concealed from view in the finished work from galvanized steel.
- B. Fabricate sheet metal with lines, arris, and angles sharp and true, and plane surfaces free from objectionable wave, warp or buckle. Form accurate to details.
 - 1. Hem exposed edges to form a 1/2 inch wide hem on the side concealed from view.
 - 2. Provide concealed stiffeners and reinforcements as necessary to provide surfaces free of objectionable wave, warp or buckle.
 - 3. Profiles, bends, and intersections shall be even and true to line.
- C. Fabricate scuppers and downspouts in accordance with the following Figure(s) and Table(s) from the SMACNA Architectural Sheet Metal Manual and as indicated on drawings. Fabricate gutters by extrusion roll-forming from prefinished metal sheet to profile indicated on Drawings or as selected by Architect and/or Owner.
 - 1. Scuppers: Figures 1-26A through 1-30C, as applicable to design indicated.
 - 2. Gutters: Figures 1-1 through 1-24D and Tables 1-5, 1-7 and 1-8, as applicable to design indicated.
- D. Fabricated downspouts as indicated on Drawings from schedule 40 galvanized steel pipe.
- E. Forming, anchoring, expansion and contraction details shall conform to referenced quality standards.
- F. Provide for thermal expansion of running trim, flashing, expansion joints, and other items exposed for more than 15 feet continuous length.
- G. Fabricate cleats and starter strips of same material as sheet.
- H. Form pieces in longest practical lengths, except form flashing and fascia in 8 to 10 foot units.
- I. Fabricate coping covers and cap flashings with double-lock standing seams in accordance with SMACNA Figure 3-3, Detail No. 25, or with double-lock flat seams in compliance with Figure 3-3, Detail No. 3, per SMACNA Architectural Sheet Metal Manual. Miter all parapet coping corners.
- J. Solder and seal metal joints or use seam sealer/adhesive as recommended by prefinished metal manufacturer. After soldering, remove flux. Wipe and wash solder joints clean.

- K. Fabricate corners from one piece with minimum 18 inch long legs, with mitered corners; solder for rigidity, seal with sealant.
- L. Fabricate flashings as indicated on Drawings. Return and brake edges.
- M. Where prefabricated counterflashing and reglet system is used, form upper edge of counterflashing with an approved snap lock flange to engage reglet receiver and to provide a spring action at bottom edge against built-up flashing.
- N. Flashing Pans: Form sheet metal pans 6 inch nominal square size, with 3 inch upstand, and 4 inch flanges. Fill pans watertight with plastic cement.

2.04 FINISH

- A. Shop prepare and prime exposed ferrous metal surfaces of unfinished galvanized steel sheet.
- B. Backpaint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 1.5 mil.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
 - 1. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, cant strips and reglets in place, and nailing strips located.
 - 2. Verify membrane termination and base flashings are in place, sealed, and secure.
 - 3. Verify substrate is dry, clean and free of foreign matter.
- B. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.
- C. Correct defects prior to installation.

3.02 INSTALLATION

- A. Installation shall conform to NRCA and SMACNA manuals.
 - 1. Slope to provide positive drainage.
 - 2. Provide sufficient hold-down clips to insure true alignment and security against wind.
 - 3. Install with 4 inch minimum overlap.
 - 4. Bed overlap joints in appropriate sealant as specified in Section 07 92 00.
 - 5. Form and lap step flashings.
 - 6. Allow sufficient tolerances for expansion and contraction.
 - 7. Insulate work to prevent electrolytic action.
- B. Expansion Seams: Maintain a watertight installation at expansion seams. Locate expansion seams as shown or if not shown, at the following maximum spacing for each general flashing use:
 - 1. Flashing, expansion joints, gravel stops, and trim: At 10 foot intervals, 24 inches on each side of corners and intersections.

2. Sealant-type expansion joints: Where sealant-filled expansion joints are used, embed the hooked flanges of the joint members not less than 1 inch into the sealant. Form joints to completely conceal the sealant. When ambient temperature is moderate at the time of installation (40 to 70 degrees F.), set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant type joints at temperatures below 40 degrees F. Installation of sealant is specified in Section 07 92 00.
- C. Where dissimilar materials abut, provide proper separation or protection to minimize the possibility of galvanic action.
- D. Soldering:
 1. Solder joints at corner fabrications.
 2. Except where other methods of joining are indicated or specified, solder joints and connections of Sheet Metal Work.
 3. Remove grease and dirt from metal surfaces to be joined.
 4. Remove flux residue by scrubbing, neutralizing with ammonia or a 5 to 10 percent solution of washing soda, followed by a clear water rinse.
 5. Assemble parts and solder using regular non-corrosive resin flux. Heat metal thoroughly to completely sweat solder through full contact area.
- E. Sealed Joints: Form nonexpansion, but movable joints in metal with flat lapped seams to accommodate elastomeric sealant to comply with SMACNA Standards. Fill joint with sealant and form metal to completely conceal sealant.
 1. Seal joints at copings and at other movable, non-expansion type joints.
- F. Reglets: Install reglets in masonry, concrete or stucco to receive flashings.
- G. Counterflashing:
 1. Provide metal counterflashing at top edges of built-up base flashings and at other locations indicated.
 2. Lap end joints a minimum of 3 inches. Do not solder or weld joints. Make flashing continuous at angles. Counterflashing shall overlap base flashing a minimum of 4 inches, unless otherwise indicated.
 3. Where counterflashing terminates in reglets, fasten flashing with lead wedges every 12 inches. Fill reglets continuously with synthetic rubber type sealant.
- H. Copings:
 1. Coordinate installation of copings with installation of roof membrane flashing extending up back of parapet walls and under coping where indicated on Drawings. Roof parapet flashing shall be completely concealed by metal coping.
 2. Extend front edge of coping covering down over the lock into a previously placed continuous cleat. Secure edge strips with nails spaced 6 inches apart.
 3. Join rear edge of coping covering to adjacent flashings as indicated.

3.03 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 07 61 00

SHEET METAL ROOFING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes prefinished architectural sheet metal roofing of the following types, including associated roof underlayment, flashing, clips, trim, closures and related accessories.
 - 1. Snap joint-seamed, standing seam metal roof panels.
 - 2. Mechanically-seamed, standing seam metal roof panels.
 - 3. Trapezoidal-rib, snap joint, standing seam metal roof panels.
 - 4. Flush face soffit panels.
 - 5. Associated custom fabricated fascia panels.

1.02 SYSTEM DESCRIPTION

- A. Building Design Codes - Uplift, Live and Dead Loads: ASCE 7-93 Minimum Loads for Buildings and Other Structures (ASCE 7-93) American Society of Civil Engineers (ASCE).
- B. Performance Requirements:
 - 1. The standing seam roof system shall be designed to safely resist the positive and negative loads as required for the location and type of project designed.
 - 2. Structural-uniform uplift load capacity of the panel system shall be determined in accordance with the principles of ASTM E1592, "Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference" as follows:
 - 3. The Factor of Safety on the test results shall be 1.65 for the panel and clip/halter ultimate loads with no increase for wind.
 - a. The Factor of Safety for fasteners shall be 3.0 for single fastener in each connection, 2.25 for 2 or more fasteners in each connection and 4.0 in masonry.
 - b. Design uplift capacity for condition of gage, span or loading other than those tested may be determined by interpolation of test results.
 - c. Deflection shall be $l/180$ for positive loading.
 - 4. Water penetration of the panel assembly at 20psf pressure for 15 minutes shall have "no uncontrollable leakage" when tested in accordance with ASTM E331.
 - 5. Air infiltration of panel assembly at 20psf pressure shall be no more than 0.02 cfm/sf of panel when tested in accordance with ASTM E283.
 - 6. The panel system shall have a U.L. Class 90 rating.
 - 7. The panel system shall have Factory Mutual approval per research standard 4471 meeting a (minimum) Class 01-90.
 - 8. Panels are to be fabricated full length with absolutely no end lap conditions allowed. The manufacturing equipment must be owned and operated by the manufacturer who must also be the installer and take complete responsibility for the entire system.
 - 9. Thermal Movement: Fasten the roofing panels to the structure through the use of concealed clips which are designed to allow for all panel movement through a temperature differential of 180°F without impeding the performance of the panel.

1.03 SUBMITTALS

- A. Shop Drawings: Submit detailed drawings showing layout of panels, anchoring details, joint details, trim, flashing, and accessories. Show details of weatherproofing, terminations, and penetrations of metal work.
- B. Samples: Submit 2 samples of each type of roof panel with factory finish.
- C. Submit results indicating compliance with minimum requirements of the following performance tests:
 - 1. Air Infiltration ASTM E 283-84.
 - 2. Water Infiltration ASTM E 331-86.
 - 3. Wind Uplift - U.L.90.

1.04 QUALITY ASSURANCE

- A. Qualifications: Manufacturer specializing in specified product with minimum 5 years documented experience.
- B. Standards: Comply with the following:
 - 1. SMACNA Architectural Sheet Metal Manual.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact. Upon receipt of panels and other materials, installer shall examine the shipment for damage and completeness.
- B. Storage: Adequately protect against damage while stored at the site.
 - 1. Store in a clean, dry place with one end elevated to allow moisture to run off.
 - 2. Panels with strippable film must not be stored in the open, exposed to the sun.
 - 3. Stack all materials to prevent damage and to allow for adequate ventilation.
- C. Handling: Comply with Manufacturer's instructions.

1.06 WARRANTY

- A. Furnish 20 year warranty against cracking, peeling and fade for paint finish of prefinished metal.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of the following Manufacturer, except as approved by the Architect, subject to compliance with Specification requirements:
 - 1. MBCI Metal Roof and Wall Systems www.mbc.com
- B. Basis of Design: Products as manufactured by MBCI Metal Roof and Wall Systems.

2.02 SHEET MATERIALS

- A. Prefinished Metal: Prefinished Metal shall be prefinished Galvalume - ASTM A792, structural quality, Grade 50, Coating Class AZ50 (Grade 340, Coating Class AZM150), prepainted by the coil-coating process per ASTM A 755.
 - 1. 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.
 - a. Bottom side shall be coated with primer with a dry film thickness of 0.25 mil.
 - b. Finish shall conform to all tests for adhesion, flexibility, and longevity as specified by the Kynar 500 finish supplier.
 - c. Color(S): As specified for each metal roof panel type below.
- B. Unfinished Metal: Unfinished Metal shall be Grade C Galvalume ASTM 792-86, AZ 55, "Pre-Weathered Finish" as indicated on Drawings.
- C. Strippable film: Liquid applied to top side of painted coil to protect finish during fabrication, shipping and field handling.

2.03 ACCESSORY MATERIALS

- A. Underlayment: (1) Layer of ASTM D226, No. 30 unperforated asphalt saturated felt.
 - 1. Underlayment Fasteners: Standard galvanized roofing nails or screws with 1 inch diameter plastic caps, or as approved by the sheet metal roofing manufacturer.
- B. Panel Clips: Provide panel clip of type specified, at spacing indicated on approved shop drawings.
 - 1. Two-piece Floating: ASTM C645, with ASTM A653, G90 (Z180) hot-dip galvanized zinc coating, configured for concealment in panel joints, and identical to clips utilized in tests demonstrating compliance with performance requirements.
 - 2. Single-Piece Fixed: ASTM C645, with ASTM A653, G90 (Z180) hot-dip galvanized zinc coating, configured for concealment in panel joints, and identical to clips utilized in tests demonstrating compliance with performance requirements.
- C. Panel Fasteners: Self-tapping screws and other acceptable fasteners recommended by roof panel manufacturer. Where exposed fasteners cannot be avoided, supply long life fasteners with EPDM or neoprene gaskets, with heads matching color of metal panels by means of factory-applied coating.
- D. Joint Sealers: Manufacturer's standard or recommended liquid and preformed sealers and tapes, and as follows:
 - 1. Factory-Applied Seam Sealant: Manufacturer's standard hot-melt type.
 - 2. Tape Sealers: Manufacturer's standard non-curing butyl tape, AAMA 809.2.
 - 3. Concealed Joint Sealant: Non-curing butyl, AAMA 809.2.
- E. Steel Sheet Miscellaneous Framing Components: ASTM C645, with ASTM A653, G60 (Z180) hot-dip galvanized zinc coating.
- F. Roof Accessories: Approved by metal roof panel manufacturer.

2.04 STANDING SEAM METAL ROOFING PANELS

- A. Fabrication - General: Fabricate preformed roofing panels in longest practical lengths, true to shape, accurate in size, square, and free of distribution or manufacturing defects.
- B. Mechanically-Seamed, Concealed Fastener, Metal Roof Panels: Structural metal roof panel consisting of formed metal sheet with vertical ribs at panel edges, installed by lapping and mechanically interlocking edges of adjacent panels, and attaching panels to supports using concealed clips and fasteners in a weathertight installation.
 - 1. Basis of Design: MBCI, SuperLok.
 - 2. Nominal Coated Thickness: 0.028 inch/24 gage.
 - 3. Panel Surface: Smooth with striations in pan.
 - 4. Panel Width: 16 inches.
 - 5. Panel Seam Height: 2 inch.
 - 6. Joint Type: Mechanically seamed.
 - 7. Color: Signature 300, Copper Metallic.
- C. Snap Joint-Seamed, Concealed Fastener, Metal Roof Panels: Structural metal roof panel consisting of formed metal sheet with vertical ribs at panel edges, installed by lapping and mechanically interlocking edges of adjacent panels, and attaching panels to supports using concealed clips and fasteners in a weathertight installation.
 - 1. Basis of Design: MBCI, LokSeam.
 - 2. Nominal Coated Thickness: 0.028 inch/24 gage.
 - 3. Panel Surface: Smooth with striations in pan.
 - 4. Panel Width: 18 inches.
 - 5. Panel Seam Height: 1.75 inch.
 - 6. Joint Type: Snap joint-seamed.
 - 7. Color: Signature 300, Copper Metallic.
- D. Trapezoidal-Rib, Snap Joint, Concealed Fastener, Standing Seam Metal Roof Panels: Structural metal roof panel consisting of formed metal sheet with raised trapezoidal ribs at panel edges, installed by lapping and interlocking edges of adjacent panels, and mechanically attaching panels to supports using concealed clips and fasteners in a weathertight installation.
 - 1. Basis of Design: MBCI, Ultra-Dek.
 - 2. Nominal Coated Thickness: 0.028 inch/24 gage.
 - 3. Panel Surface: Smooth with minor ribs in pan.
 - 4. Panel Width: 24 inches.
 - 5. Panel Seam Height: 3 inch.
 - 6. Joint Type: Snap joint.
 - 7. Color: Pre-weathered Galvalume.

2.05 FORMED METAL SOFFIT PANELS

- A. Flush-Profile, Concealed Fastener Metal Soffit Panels: Metal panels consisting of formed metal sheet with vertical panel edges, with flush joints between panels, field assembled with nested lapped edges, and attached to supports using concealed fasteners.
 - 1. Basis of Design: MBCI, Artisan Series Panels.
 - 2. Nominal Thickness: 0.023 inch/24 gage coated thickness, with smooth surface.
 - 3. Panel Width: 12 inches.
 - 4. Panel Thickness: 1 inch.
 - 5. Color: Signature 300, Copper Metallic.

2.06 CUSTOM FASCIA PANELS

- A. Custom fabricated as indicated on Drawings with 3/4 inch “v” reveals.
 - 1. Nominal Thickness: 0.023 inch/24 gage coated thickness, with smooth surface and formed “v” reveals as detailed.
 - 2. Color: Signature 300, Copper Metallic.

2.07 FABRICATION

- A. General: Provide factory fabricated and finished metal panels and accessories meeting performance requirements, indicated profiles, and structural requirements.
- B. Fabricate metal panel joints configured to accept factory-applied sealant providing weathertight seal and preventing metal-to-metal contact and minimizing noise resulting from thermal movement.
- C. Form panels in continuous lengths for full length of detailed runs, except where otherwise indicated on approved shop drawings. Form sections square and accurate to profile, free from distortion or defects detrimental to appearance or performance.
- D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's written instructions, approved shop drawings, and project drawings. Form from materials matching metal panel substrate and finish. Hem exposed edges on underside 1/2 inch.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
 - 1. Examine plywood or metal deck to ensure proper attachment to framing.
 - 2. Inspect roof deck to verify deck is clean and smooth, free of depressions, waves or projections, properly sloped to valleys and eaves.
 - 3. Verify roof openings, curbs, pipes, sleeves, ducts or vents through roof are solidly set, cant strips and reglets in place, and nailing strips located.
 - 4. Verify deck is dry and free of snow or ice. Flutes in steel deck to be clean and dry and joints in wood deck to be solidly supported and nailed.
 - 5. Ensure that all nail heads are totally flush with the substrate.
- B. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 UNDERLAYMENT INSTALLATION

- A. Underlayment Installation:
 - 1. Install (1) layer asphalt felt underlayment over entire area to be roofed.
 - 2. Install from eave to ridge in shingle fashion free of wrinkles.
 - 3. Install horizontally, with 6 inch minimum weather overlaps and minimum 36 inch end laps.
 - 4. Stagger end laps of each consecutive layer a minimum of 24 inches.
 - 5. Use adhesive for temporary anchorage, where possible, to minimize use of mechanical fasteners under sheet metal roofing.
 - 6. Ensure that all fastener heads are totally flush with the substrate. Do not use one-piece nail caps.

- B. Ensure installed underlayment is installed horizontally, flat, smooth and free from punctures and tears.
- C. Install sheet metal roofing immediately after installation of underlayment to avoid over exposure from elements and drying of the roof underlayment.
- D. Dry, brittle or wrinkled underlayment shall be removed and new underlayment installed prior to installation of metal roofing.

3.03 STANDING SEAM METAL ROOFING INSTALLATION

- A. Comply with Manufacturers standard instructions and conform to SMACNA Architectural Sheet Metal Manual to achieve a watertight installation.
- B. Install sheet metal flashing, fascia and trim in compliance with manufacturer's instructions.
 - 1. Fascia: Align bottom of sheet metal roofing and fasten with blind rivets, bolts, or self-tapping screws. Flash and seal sheet metal roofing with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.
 - 2. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
- C. Metal Roof Panels:
 - 1. Install weathertight metal panel system in accordance with manufacturer's written instructions, approved shop drawings, and project drawings.
 - 2. Install metal roof panels in orientation, sizes, and locations indicated, free of waves, warps, buckles, fastening stresses, and distortions.
 - 3. Install panels in such a manner that horizontal lines are true and level and vertical lines are plumb.
 - 4. Install starter and edge trim before installing roof panels.
 - 5. Remove protective strippable film prior to installation of roof panels.
 - 6. Anchor panels and other components securely in place. Provide for thermal and structural movement.
 - 7. Attach panels to supports using clips, screws, fasteners, and sealants recommended by manufacturer and indicated on approved shop drawings.
 - 8. Fasten metal panels to supports with concealed clips at each location indicated on approved shop drawings, with spacing and fasteners recommended by manufacturer.
 - 9. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.
 - 10. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
 - 11. Provide weatherproof jacks for pipe and conduit penetrating metal panels of types recommended by manufacturer.
 - 12. Dissimilar Materials: Where elements of metal panel system will come into contact with dissimilar materials, treat faces and edges in contact with dissimilar materials as recommended by manufacturer.

3.04 METAL SOFFIT PANEL INSTALLATION

- A. Concealed-Fastener Formed Metal Soffit Panels: Install metal panel system in accordance with manufacturer's written instructions, approved shop drawings, project drawings, and referenced publications. Install metal panels in orientation, sizes, and locations indicated. Anchor panels and other components securely in place. Provide for thermal and structural movement.
- B. Fasten metal panels to supports with fasteners at each location indicated on approved shop drawings, at spacing and with fasteners recommended by manufacturer. Fasten panel to support structure through leading panel flange. Fit back flange of subsequent panel into secured flange of previous panel.
 - 1. Cut panels in field where required using manufacturer's recommended methods.
 - 2. Provide weatherproof jacks for pipe and conduit penetrating metal panels.
 - 3. Dissimilar Materials: Where elements of metal panel system will come into contact with dissimilar materials, treat faces and edges in contact with dissimilar materials as recommended by metal panel manufacturer.
- C. Attach panel flashing trim pieces to supports using recommended fasteners and joint sealers.
- D. Joint Sealers: Install liquid sealants where indicated and where required for weatherproof performance of metal panel assemblies.
 - 1. Seal panel joints and openings using joint sealers indicated in manufacturer's instructions.
 - 2. Prepare joints and apply sealants per requirements of Division 07 Section "Joint Sealants."

3.05 ACCESSORY INSTALLATION

- A. General: Install metal panel trim, flashing, and accessories using recommended fasteners and joint sealers, with positive anchorage to building, and with weather tight mounting. Provide for thermal expansion. Coordinate installation with flashings and other components.
 - 1. Install components required for a complete metal panel assembly, including trim, copings, flashings, sealants, closure strips, and similar items.
 - 2. Comply with details of assemblies utilized to establish compliance with performance requirements and manufacturer's written installation instructions.
 - 3. Provide concealed fasteners except where noted on approved shop drawings.
 - 4. Set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently weather resistant.
- B. Joint Sealers: Install joint sealers where indicated and where required for weathertight performance of metal panel assemblies, in accordance with manufacturer's written instructions.
 - 1. Prepare joints and apply sealants per requirements of Division 07 Section "Joint Sealants."

3.06 CLEANING AND PROTECTION

- A. Remove temporary protective films immediately in accordance with metal roof panel manufacturer's instructions. Clean finished surfaces as recommended by metal roof panel manufacturer.
- B. Do not allow traffic on completed roof. If required, provide cushioned walk boards.
- C. Protect installed roof panels and trim from damage caused by adjacent construction until completion of installation.

- D. Replace damaged panels and accessories that cannot be repaired to the satisfaction of the Architect.
- E. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 07 72 00

ROOF ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes the following:
 - 1. Roof hatches.
 - 2. Pop-up safety posts for roof hatches.
 - 3. Roof curbs and equipment supports.

1.02 SUBMITTALS

- A. Product Data: Submit Manufacturer's Specifications, design data and installation instructions.
- B. Shop Drawings: Submit Drawings showing layout, dimensions and construction details.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.
- B. Storage: Adequately protect against damage while stored at the site.
- C. Handling: Comply with Manufacturer's instructions.

1.04 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions shown on Drawings by taking field measurements; proper fit and attachment of parts is required.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the following Manufacturers, except as otherwise approved by the Architect, subject to compliance with Specifications requirements:
 - 1. Roof Hatches and Ladder Safety Posts:
 - a. Bilco Co. www.bilco.com
 - b. Bristolite www.bristolite.com
 - c. Babcock-Davis Div., Cierra Products www.babcockdavis.com
 - d. J.L. Industries www.jlindustries.com
 - e. Nystrom Building Products www.nystrom.com
 - f. O'Keeffe's Inc. www.okeefes.com
 - 2. Roof Curbs and Equipment Supports:
 - a. AES Inc., Yerington, NV www.aescurb.com
 - b. Pate Co., Lombard, IL www.patecurbs.com
 - c. Roof Products, Inc., Phoenix, AZ www.rpicurbs.com
 - d. Roof Products & Systems, Bensenville, IL www.rpscurbs.com

2.02 MANUFACTURED UNITS

- A. Roof Hatch: Galvanized steel, 14 gauge cover and curb, 22 gauge cover liner. 1 inch thick rigid insulation in curb and cover, 12 inch high curb.
 - 1. Size(s): Provide roof access hatch of size indicated on Drawings, based on the following products as manufactured by Bilco www.bilco.com:
 - a. 36 x 36 inches for ladder access: Bilco Type E-20.
 - 2. Provide heavy-duty slam-type latching mechanism with heavy-duty padlock hasp.
 - 3. Provide vandal resistant features as available.
 - 4. Finish: Powder coat; standard color as selected.
- B. Curbs: Pate Style pc-1b, or equivalent from one of the specified manufacturers, box section design, heavy gauge galvanized steel construction, continuous mitered and welded corner seams, integral base plate, factory installed wood nailer, and insulated with 1-1/2 inch thick rigid fiberglass board insulation.
- C. Equipment Supports: Pate Style es-1, or equivalent from one of the specified manufacturers, monolithic construction, heavy gauge galvanized steel, continuous mitered and welded corner seams, integral base plate, factory installed 2 inch x 4 inch wood nailer, and heavy gauge galvanized steel counterflashing.
- D. Pipe Curb Assemblies: Pate Style pca-1, or equivalent from one of the specified manufacturers, with curb constructed of heavy gauge galvanized steel with continuous welded corner seams, factory installed wood nailer insulated with 1-1/2 inch thick rigid fiberglass board insulation, cover of acrylic clad ABS thermoplastic, including graduated step PVC, boots, adjustable stainless steel clamps and cap fastening screws. Each assembly shall include curb, cap, boots and clamps. See Drawings for size and quantity of pipe penetrations.
- E. Ladder extension (for roof hatches): Bilco Model 1 LadderUP safety post, or Bristolite Grab Bar.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

- A. Install roof specialties at locations shown or required in accordance with Manufacturer's instructions and as detailed on Drawings.
- B. Install roof hatches, equipment supports and bases, curbs and curb assemblies, at locations indicated, fastening securely to deck through curb flange.

3.03 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 07 84 00

FIRESTOPPING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes firestopping as shown on Drawings and as specified herein.
- B. Related Sections:
 - 1. Section 07 21 00 – Building Insulation, for fire-safing insulation.

1.02 SYSTEM DESCRIPTION

- A. Provide UL Classified or Warnock Hersey Listed firestopping system to prevent the spread of fire, smoke and gasses through penetrations in fire resistive walls, floors and partitions, including; but not limited to; the following areas:
 - 1. Unprotected openings and openings accommodating penetrating items such as cables, cable trays, pipes, ducts, boxes and conduits through fire rated floors, walls and smoke barriers.
 - 2. Head of wall openings between wall and connecting floor or roof deck assemblies.
 - a. Meet requirements for exposure to hose stream test.
 - b. Applicable for use with steel fluted deck floor assemblies.
 - b. Allow deflection of floor or roof above.
- B. Firestop systems shall not be intended to support live loads and traffic unless specifically approved by Testing Agency.
- C. Firestop systems shall be approved by Code Authority.
- D. Firestop products shall remain flexible where subject to movement without affecting the integrity of the product.

1.03 SUBMITTALS

- A. Product Data: Submit Manufacturer's Specifications, performance criteria, Drawings and instructions.
- B. Shop Drawings: Submit Manufacturer's complete Shop Drawings showing proposed material, reinforcement, anchorage, fastenings method of installation and UL or Warnock Hersey listing number.
- C. Test Reports: Submit UL or Warnock Hersey test report description for firestopping system.
- D. Provide certificate of compliance from authority having jurisdiction indicating approval of firestop systems.

1.04 QUALITY ASSURANCE

- A. Qualifications: Applicator with minimum of 5 years experience and approved by the materials manufacturer.

- B. Regulatory Requirements: Conform to applicable code for fire resistance ratings and surface burning characteristics:
 - 1. ASTM E 136, ASTM E 119 and ASTM E 814, as applicable.
 - 2. UL 1479 fire test to achieve required fire-rating as noted on Drawings.
 - 3. Listing:
 - a. UL Fire Resistance Directory (current edition).
 - b. WH International Listings
 - 4. UL 2079, "Test for Fire Resistance of Building Joint Systems."

1.05 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.
- B. Storage: Adequately protect against damage while stored at the site.
- C. Handling: Comply with Manufacturer's instructions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish firestop systems acceptable to governing Code Authority from one of the following Manufacturers, subject to compliance with Specification requirements:
 - 1. U.S. Gypsum Co. www.usg.com
 - 2. Johns-Manville www.jm.com or www.jmfirestopping.com
 - 3. Tremco, Inc. www.tremcosealants.com or www.tremcofirestop.com
 - 4. RectorSeal Corporation www.rectorseal.com
 - 5. 3M Fire Protection Products www.3m.com
 - 6. Specified Technologies, Inc. www.stifirestop.com
 - 7. HILTI Firestop Systems www.hilti.com
 - 8. Nelson Firestop Products www.nelsonfirestop.com
 - 9. Grace Construction Products – Flamesafe www.grace.com

2.02 MATERIALS

- A. Firestop System Materials - General:
 - 1. Appropriate for penetration.
 - 2. Include every component required for code approved installation, including; but not limited to:
 - a. Firestopping putties or compound.
 - b. Backing material.
 - c. Wrap strips.
 - d. Primers, clips and collars.
 - e. Forming and damming materials.
 - f. Cleaners.
 - g. Sealant and fireblock
 - h. Firestop devices.
- B. Properties:
 - 1. Free of asbestos, halogens and volatile components after curing and shall not slump or sag, (except for self-leveling products).
 - 2. Capable of maintaining an effective barrier against flames, heat and smoke in compliance with the requirements of ASTM E814, UL 1479 and U.B.C. Standard 7-5.

3. Non-combustible per ASTM E 136.
4. UV resistant where exposed to sunlight.
5. Water resistant where exposed to moisture.
6. Firestop system shall accommodate movement without adversely affecting fire rating of wall/floor assembly.
7. Shrink resistant.
8. Paintable or capable of receiving finish materials in those areas which are exposed to view and which are scheduled to receive finishes.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter which may affect bond of firestopping material.
- B. Remove incompatible materials which affect bond.
- C. Install backing materials to arrest liquid material leakage, if required.

3.03 INSTALLATION

- A. Installation shall conform to requirements of qualified designs or manufacturer approved modifications as supported by engineering reports, and shall be approved and accepted by the authority having jurisdiction.
 1. Apply primer and firestop materials in accordance with Manufacturer's instructions and in accordance with the appropriate UL Fire Resistance Directory or with the appropriate Warnock Hersey International Listing.
 2. Apply firestopping material in sufficient thickness to achieve rating, to ensure against the passage of flames, smoke and toxic gases, and to a uniform density and texture.
 3. Protect materials from damage on surface subjected to traffic and install cover plates as required on firestop system that will or may be subject to traffic.
 4. Tool surfaces of firestop products to provide a smooth and clean appearance.
- B. Provide firestopping for conditions specified whether or not firestopping is indicated, and, if indicated, whether such material is designated as insulation, safing or otherwise. Insulation types specified in other sections shall not be installed in lieu of firestopping materials.
- C. Interior Walls and Partitions:
 1. Construction joints between top of fire rated walls and underside of floors or roof above shall be firestopped.

2. Firestop systems installed shall have been tested by either UL or Warnock Hersey, including exposure to hose stream test and including test for use with steel fluted deck floor assemblies.
 3. Firestop system used shall allow for deflection of floor or roof above.
- D. Penetrations:
1. Penetrations include conduit, cable, wire, pipe, duct or other elements which pass through one or both outer surfaces of a fire rated floor, wall, or partition.
 2. Provide firestopping to fill spaces in accordance with ASTM E 814 (UL 1479) where a penetration occurs through a structural floor or roof and a space would otherwise remain open between the surfaces of the penetration and the edge of the adjoining structural floor or roof, except at floors on grade.
 3. Requirements for penetrations shall apply whether or not sleeves have been provided. Firestop the annular space between sleeve and surrounding surfaces.

3.04 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 07 92 00

JOINT SEALERS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes the following:
 - 1. Joints sealants and installation accessories.

1.02 SUBMITTALS

- A. Product Data:
 - 1. Submit Manufacturer's current specifications and recommended installation procedures.
 - 2. Submit sample warranty to be signed jointly by applicator and Manufacturer.
 - 3. Submit Manufacturer's standard color chart.
 - 4. Certification in the form of standard data sheet or letter that each type of compound and sealant to be furnished complies with these specifications.
 - 5. Statement that each product to be furnished is recommended for the application shown for this project.
 - 6. Complete instructions for handling, storage, mixing, priming, installation, curing and protection of each type of sealant.
- B. Shop Drawings: Illustrations in sufficient detail to show installation and interface of the work of this Section with the work of adjacent trades.
- C. Submit three (3) samples of each specified product, 12 inch minimum lengths, and installed between representative samples of materials to be sealed for each product. Architect's acceptance will be for color only.
- D. Certifications: Submit certification signed jointly by Contractor and Sealant Manufacturer, certifying that products comply with specification requirements, are proper and adequate for the condition of installation and use, have been properly selected and designed for applications where they are to be installed, and that sealants and accessory materials have been installed in accordance with Manufacturer's printed instructions and recommendations of Manufacturer's field representative.
- E. Provide a procedure detailing the cleaning, priming, taping, tooling and other steps recommended to ensure satisfactory function and appearance.
- F. Contract Closeout: Submit Manufacturer's Warranty.

1.03 QUALITY ASSURANCE

- A. Qualifications: Installers shall be thoroughly trained and experienced in the necessary skills and shall be thoroughly familiar with the specified requirements.
- B. Field Adhesion Testing: Perform preconstruction adhesion testing for each type of sealant and substrate as follows:
 - 1. Arrange for Manufacturer's field technical representative to be present during testing.
 - 2. Install sealant in test joints in minimum 60 inch lengths.
 - 3. Test joints by standard field adhesion hand pull test.

4. For joints with dissimilar substrates, test adhesion to each substrate separately as recommended by sealant Manufacturer.
 5. Conduct number of field adhesion tests for each type of sealant and each type of substrate as follows:
 - a. Not less than 10 tests for the first 1,000 feet of installed sealant and 1 test for each additional 1,000 feet of sealant installed, or 1 test per floor per elevation.
 6. Document results of field adhesion tests and record results in field adhesion test log.
 7. Include in log data on pull distance used to test each joint sealant.
 8. Include data on joints where material connected with pull portion of sealant failed to adhere to joint substrate or tore cohesively.
 9. Inspect joints and record data for the following:
 - a. Complete fill.
 - b. No voids.
 - c. Joint dimensions matching those of Manufacturer's recommended details.
 10. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
 11. Do not install joint sealants that fail to adhere to joint substrates during testing.
 12. Repair sealant test areas by removing damaged materials and applying sealant to test area using same procedure used to originally install the sealant.
- C. Stain Testing: Perform Stain testing of natural stone, masonry and other porous substrates proposed for use in the Work. Obtain actual samples of materials proposed for use and test to determine if permanent discoloration of porous surfaces will occur from direct contact with sealants. Perform stain testing in conformance with ASTM C1248 and as follows:
1. Arrange for Manufacturer's field technical representative to be present during examination of test results.
 2. Cut substrate to provide flat surface for application of sealant.
 3. Separate substrate materials by removable shims to create 1/2 x 1/2 x 3 inch joint.
 4. Fill joint with scheduled sealant, tool, and allow to cure for 21 days at room temperature.
 5. After 21 day curing, remove shims, compress joint to 50 percent of original joint width to 1/4 inch, and place in an oven at 158 degrees F. for 14 days.
 6. After 14 days in oven, remove and allow sample to cool to room temperature.
 7. Examine sample to determine presence of discoloration or change in appearance in any way to exposed surfaces.
 8. After visual inspection, cut sample in half to determine presence of discoloration or change in appearance in any way into the sample itself at the adhesive bond line and presence of bleeding into the area around the adhesive bond line.
 9. Document results of stain tests and record results in stain test log.
 10. Do not install sealants that show evidence of staining substrates.
- D. Field Color and Workmanship Samples: Seal a section of joint as directed, under job conditions, at least 7 days prior to start of work for review by Architect. When approved, sample shall be used as a standard of comparison for remainder of work.
- E. Manufacturer and sealants Subcontractor to submit log of testing, on company letterhead for each test performed indicating, but not limited to the following:
1. Date
 2. Project identification
 3. Sealant identification including name, type and batch number

4. Test performance, i.e., acceptable, marginal, not acceptable
 5. Storage conditions
 6. Signature of person conducting test
- F. Location where the test was conducted.
- G. If tests indicate sealant material is marginal or not acceptable, sealant is not to be used. Tester is to immediately notify Architect and Contractor of the deficient materials. The sealant Subcontractor is to immediately remove deficient materials from site.
- H. Inspections
1. Coordinate sealant selection and application as necessary for the full and satisfactory compatibility and performance between all sealants used under this section with all other applicable and related sections using sealants that may be in direct contact with work of this section.
 2. Take all required steps and precautions to properly isolate and prevent any degree of incompatibility between sealants, all in strict accordance with Manufacturer's specifications, recommendations and instructions.
 3. Contractor is to periodically test sealants in place in addition to the Manufacturer's field testing, for adhesion, using methods recommended by sealant Manufacturer. Promptly replace all sealant that does not adhere or fails to cure.
 4. Contractor shall arrange to meet the sealant Manufacturer at the jobsite and witness initial installation of sealant on the project with the Contractor, Architect and other Consultants.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.
- B. Storage: Adequately protect against damage while stored at the site. Maintain product in accordance with Manufacturer's recommendations with proper precautions to ensure fitness of material when installed.
- C. Handling: Comply with Manufacturer's instructions.

1.05 PROJECT/SITE CONDITIONS

- A. Environmental Requirements: Observe Manufacturer's temperature service range. Do not apply sealant when weather conditions will inhibit bonding and curing.

1.06 WARRANTY

- A. Provide warranty, in writing and signed jointly by the installer and sealant Manufacturer, to replace sealants which fail at no additional cost to the Owner because of loss of cohesion or adhesion, or do not cure, and which fail to achieve air-tight and water-tight seal as follows:
1. Sealant Types "A" and "B": 5 years.
 2. Sealant Types "C1" and "C2": 20 years.
 3. Sealant Types "D," "E" and "F": 2 years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the following manufacturers, except as approved otherwise by the Architect, subject to compliance with specifications requirements:
1. Pecora www.pecora.com
 2. Dow Corning Corp. www.dowcorning.com
 3. General Electric www.ge.com
 4. Sika Corporation www.usa.sika.com
 5. Sonneborn / Chemrex www.chemrex.com

2.02 MATERIALS

- A. General: Sealants, primers, back-up materials, preformed joint fillers, bond breakers and related materials shall be compatible with adjoining materials.
- B. Sealant:
1. General: The selection of proper sealant for a particular joint shall be in accordance with current published recommendations of the Manufacturer.
 2. Types: See Schedule in Part 3 for the location where each type of sealant is to be provided.
 - a. Type "A": Ultra-low modulus, self-leveling, one-component, silicone sealant conforming to ASTM C920, Type S, Grade SL, Class 100/25, Use T, A, M, and O; Dow Corning SL Parking Structure Sealant (Self Leveling), Pecora 300/310 SL, or Tremco Spectrem 900 SL; OR Low-modulus, non-sag, one-component silicone sealant conforming to ASTM C920, Type S, Grade NS, Class 100/25, Use T, A, M, and O. Dow Corning NS Parking Structure Sealant (Non-Sag), Pecora 301/311 NS, or Tremco Spectrem 800; OR Ultra-low modulus, fast-cure, two-component, neutral-cure silicone sealant conforming to ASTM C920, Type S, Grade FC, Class 100/25, Use T, A, M, and O; Dow Corning FC Parking Structure Sealant (Fast Cure).
 - b. Type "B": Silicone sealant conforming to ASTM C920, Type M, Grade NS, Class 25, Use NT, M, A, O, and capable of withstanding movement of 50% in extension and compression, and sustained temperatures of 250 degrees F in service. Dow Corning 790, 795, CCS and CWS.
 - c. Type "C-1": One-part low modulus moisture cure silicone rubber sealant conforming to FS TT-S-005143A, Class A, FS TT-S-00230C, Type II, Class A and ASTM C 920, Type S, Grade NS, Class 25, Use NT, M, G, A, and O, and capable of withstanding movement of 100% in extension and 50% in compression in service. Dow Corning 790 Silicone Glazing Sealant or Pecora 890.
 - d. Type "C-2": One-part medium modulus neutral cure silicone rubber sealant conforming to FS TT-S-001543A, Class A, FS TT-S-00230C, Type II, Class A and ASTM C 920, Type S, Grade NS, Class 25, Use NT, M, G, A, and O, and capable of withstanding movement of 50% in extension and 50% in compression in service. Pecora 895, Dow Corning 795 or Dow Corning 791 or 756 SMS (non-staining), Sika Sikasil-N Plus US. Provide Dow Corning 756 SMS where sealant with reduced soiling is indicated.
 - e. Type "D": Medium-modulus, single-component, pre-pigmented, neutral-cure silicone sealant conforming to ASTM C920, Type S, Grade NS, Class 50, Use NT, G, M, A, O. Dow Corning 756 SMS Building Sealant, Sika Sikasil WS-295.

- f. Type "E": Silicone rubber sealant with mold inhibitor. General Electric Sanitary 1700, Tremco Tremsil 200, Dow Corning 786, Pecora 898, Sonneborn Omni-Plus.
 - g. Type "F": Tremco Acoustical Sealant and Pecora BA-98.
 - 3. Color: Provide standard or custom colors as selected by Architect. In general, colors shall match adjacent materials.
- D. Primer: Non-staining type, recommended by sealant Manufacturer to suit application.
- E. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant Manufacturer; compatible with joint forming materials.
- F. Joint Filler (Backer):
 - 1. Buildings: ASTM C1330, Type B; round bi-cellular or closed cell polyethylene, urethane or neoprene foam rod; oversized 30 to 50 percent; "SofRod" as manufactured by Nomaco.
 - 2. Pavement: ASTM D5249, Type 3, round bi-cellular or closed cell polyethylene, urethane or neoprene foam rod; oversized 30 to 50 percent; "SofRod" as manufactured by Nomaco.
- G. Bond Breaker: Pressure sensitive tape recommended by sealant Manufacturer to suit application.
- H. Gloss Reducer: Silica sand No. 20, color to match adjacent surface. Gloss reducer shall be provided at traffic sealant applications.
- I. Other Materials: Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor and approved by the sealant Manufacturer as compatible, subject to the review by the Architect.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces. Verify, before proceeding with this Work that required inspections of existing conditions have been completed.
- B. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this Work.

3.02 PREPARATION

- A. Clean, prepare, and prime joints in accordance with Manufacturer's instructions. Remove loose materials, dust, oil, grease, water, surface dirt, frost, old caulking material and other foreign matter which may impair adhesion of sealant.
 - 1. Clean porous materials where necessary by grinding, sand or water-blast cleaning, mechanical abrading, acid washing or combination of these methods as required to provide a clean, sound base surface for sealant adhesion. Clean nonporous surfaces, either mechanically or chemically.

2. Remove laitance by acid washing, grinding or mechanical abrading. Remove form oils by sand or water-blast cleaning. Remove all loose particles present or resulting from grinding, abrading or blast cleaning by blowing out joints with oil free compressed air or by vacuuming joint prior to application of primer or sealant.
 3. Remove protective coatings from metallic surfaces by two rag solvent wipe method. Use clean white cloths or lint free paper towels for cleaning with solvent and drying. Clean joint areas protected with masking tape or strippable film with solvent after removal of tape or film. Do not allow solvent to air dry without wiping.
- B. Verify that joint shaping materials and release tapes are compatible with sealant.
- C. Examine joint dimensions and size materials to achieve required width/depth ratios.
1. Joint widths, depths, and conditions detailed on shop drawings by related work contractors shall be considered as minimum allowable requirements except where they may conflict with sealant Manufacturer's recommendations. In all cases, joints must be uniform in width. Do not seal joints until they are in compliance with drawings, or meet the accepted control section standard. Notify general Contractor and Architect of Conditions not compliant with Drawings or acceptable standards.
 2. Clean out and rake to full width and depth, joints to receive sealant, back-up material or preformed joint filler. Make joints of sufficient width and depth to accommodate specified back-up material or preformed joint filler and sealant.
- D. Use joint filler to achieve required joint depths, to allow sealants to perform properly.
- E. Use bond breaker where required.
- F. Protect adjacent surfaces from damage by masking when necessary.

3.03 INSTALLATION

- A. General:
1. Install sealant in accordance with Manufacturer's instructions.
 2. In general, seal openings and other locations which normally require sealant to seal against infiltration from air, water and most insects, including; but not limited to:
 - a. Construction and expansion joints.
 - b. Joints between dissimilar materials.
 - c. Joints around windows, door frames, louvers and other penetrations and openings in the exterior wall.
 - d. Interior wall openings.
 - e. Other locations indicated on drawings.
 3. Follow sealant Manufacturer's instruction regarding surface preparation, priming, application life, and application procedure. Consult sealant Manufacturer for recommendation for application procedure. Apply sealant within recommended temperature ranges. Consult Manufacturer when sealant cannot be applied within recommended temperature ranges. Consult sealant Manufacturer for recommendation for application of silicone sealant when air temperature is below 40 degrees F., or surface temperatures of sealant contact surfaces are above 115 degrees F.
 4. Apply masking tape, where required, in continuous strips in alignment with joint edge. Remove tape immediately after joints have been sealed and tooled as directed. Sealant on face of adjacent stone or other materials will not be acceptable.

- B. Joints shall be free of air pockets, foreign embedded matter, ridges, and sags.
 - 1. Tool joints concave.
- C. Apply sealant under pressure with hand or power actuated gun or other appropriate means. Gun shall have nozzle of proper size and provide sufficient pressure to completely fill joints as detailed.
- D. Neatly point or tool joint surfaces to provide slightly concave surfaces, free of wrinkles and skips, uniformly smooth and with perfect adhesion along both sides of joint. All joints to be "Dry tooled". Do not use water-wet tool or tooling solutions.
- E. Sealant applied to joints adjacent to mortar joints shall be sanded to achieve texture similar to that of adjacent mortar joint.
- F. Sealant around perimeter of aluminum storefront and entrance door frames, Hollow metal door frames, louvers and similar items within EIFS walls shall be applied to the EIFS base coat. Coordinate sealant application with installation of EIFS system.
- G. Consult sealant Manufacturer regarding the proper method of installing back-up material or joint filler at proper depth in joint to provide specified sealant dimensions. Compress back-up material 25 to 50 percent into the joints as required. Do not apply sealant without back-up materials. Install bond breaker strip between sealant and non-release type back-up material. Three side adhesion is acceptable only for the sealing at joinery of members that are to be rigidly attached to each other by means of screws or welding restricting all movement.
- H. Install back-up rod stock into the joint to avoid length-wise stretching. Rod stock shall not be twisted or braided. Use bond breaker strip in all joints where sufficient room for back-up does not exist.
- I. Surfaces of joints to be sealed must be dry. Do not attempt sealant work on wet surfaces or where frost is present. Consult sealant Manufacturer regarding the procedures for determining acceptable surface conditions.

3.04 CLEANING

- A. Clean adjacent surfaces of sealant as work progresses.
- B. Use solvent or cleaning agent as recommended by sealant Manufacturer.
- C. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises.

3.05 SCHEDULE

- A. Expansion and Control Joints:
 - 1. Horizontal traffic: Type "A" with gloss reducer.
 - 2. Joints around exterior windows and doors, exterior columns, louvers, masonry, concrete to concrete, steel, wall penetrations, connections, parapet caps, other joints to seal off building from exterior air and moisture: Type "B".
 - 3. Glass (except insulating glass or special coated glass), aluminum, E.I.F.S., Natural Stone, and plastics: Type "C-1".
 - 4. Glass (including insulating glass or special coated glass), aluminum and plastics: Type "C-2".
 - 5. Masonry and Painted Metals: Type "D".

- B. Non-expanding Joints:
 - 1. Glass (except insulating glass or special coated glass), aluminum, E.I.F.S., Natural Stone, and plastics: Type "C-1".
 - 2. Glass (including insulating glass or special coated glass), aluminum and plastics: Type "C-2".
 - 3. Masonry and Painted Metals: Type "D".
 - 4. Concrete to concrete, masonry, aluminum, steel, and wood: Type "C-1".
- C. Mechanical (ductwork and air conditioning): As specified in Division 23, or Type "D" if not indicated in Division 23.
- D. Plumbing Fixtures and other Wet Areas (around toilet, bath, kitchen fixtures, and food service equipment): Type "E".
- E. Acoustical (acoustical applications where sealant is required): Type "F".

END OF SECTION

SECTION 08 11 13

STEEL DOORS AND FRAMES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes hollow metal steel doors and frames, as shown on Drawings and as specified herein.

1.02 SUBMITTALS

- A. Shop Drawings: Submit Drawings showing elevations of each door and frame type, typical and details of construction, location and installation requirements for hardware, size and thickness of material.
- B. Fire Rated Doors and Frames:
 - 1. Installation Instructions: Door and frame manufacturer shall clearly identify the hardware products, other materials and work requirements necessary to maintain compliance with UL 10(c) (positive pressure testing) as required by 2006 IBC Section 714.
 - 2. Certification: Submit certification that fire rated doors (including frames and hardware as a unit) will comply with UL 10(c) (positive pressure testing) as required by 2006 IBC Section 714.
- C. Furnish recognized independent test lab certification that products comply with ANSI A250.4.

1.03 DELIVERY AND STORAGE

- A. Deliver welded frames with spreaders and doors with wrappers.
- B. Store doors and frames under protective cover in dry, enclosed spaces at the site. Place doors and frames on non-staining blocking. Raise bottoms of doors at least 4 inches high and provide 1/4 inch air space between stacked doors to avoid metal to metal contact and permit air circulation.

1.04 QUALITY ASSURANCE

- A. Doors and frames shall be certified to comply with ANSI A250.4, Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors and Hardware Reinforcing, and ANSI A250.8, Recommended Specifications for Standard Steel Doors and Frames.

1.05 WARRANTY

- A. Special Warranty: Furnish the following warranty to Owner:
 - 1. Warrant doors against defects in materials and workmanship for a period of 3 years after date of substantial completion of Project.
 - 2. Replacement under warranty shall include removal of the defective door and hardware, hanging, re-installation of hardware, and painting including adjacent finishes if damaged.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish steel doors and frames from one of the following Manufacturers, except as approved otherwise by the Architect, subject to compliance with specifications requirements:
 - 1. Steelcraft Manufacturing Co. www.steelcraft.com
 - 2. Curries Company www.curries.com
 - 3. Door Components Inc. www.doorcomponents.com
 - 4. The Ceco Corporation www.cecodoor.com
 - 5. The Kewanee Corp. www.kewaneecorp.com
 - 6. Republic Builders Products www.republicdoor.com
 - 7. Fleming Steel Doors and Frames www.flemingdoor.com
- B. Doors and frames shall be furnished by the same Manufacturer.

2.02 MATERIALS

- A. Doors: Furnish Level, Model and Physical Performance level in accordance with ANSI A250.8/SDI-100.
 - 1. Level: Level 3, 16 gauge.
 - 2. Physical Performance level: Level B at interior doors and Level A at exterior doors, or as otherwise scheduled or indicated on Drawings.
 - 3. Model: Model 2, Seamless.
- B. Core: Honeycomb, Polystyrene, Polyurethane, or Vertical steel stiffener core. Core shall be as allowed by UL 10(c) for fire rated doors. Provide polystyrene or polyurethane core at exterior doors.
- C. Frames: ANSI A250.8/SDI 100, 14 gauge steel at interior frames and 16 gauge steel at exterior frames with 16 gauge doors, or as otherwise scheduled or indicated on Drawings.
- D. Glazing Beads: Minimum 20 gauge steel.
- E. Steel: ASTM A1008 cold-rolled or ASTM A1011 hot-rolled. Hot-dip galvanized meeting ASTM A653, Grade G60 or Grade A60 galvanized for exterior openings.
- F. Rain Drips: Reese A201 A, or equal by Pemko or National Guard.
- G. Paint: Non-lifting, rust-inhibitive grey primer meeting ANSI A224.1, compatible with field finish specified in Section 09 91 00, applied after bonderizing.

2.03 FABRICATION- DOORS

- A. Construct hollow metal doors, flush and vision lite types as scheduled on Drawings, in accordance with ANSI A250.8/SDI-100 with core as specified above. Reinforce top and bottom of doors horizontally by 16 gauge steel channels, full width, spot welded to each face at least 3 inches on center. Bevel edge of lock stile.
 - 1. Door Top Edge: Close top of all doors flush as an integral part of the door construction, or by placing end closure channel with web of channel flush with top edge of door (not inverted), or by addition of end cap at top of door, spot welded to each face at least 3 inches on center, filled and dressed smooth.
 - 2. Door Bottom Edge: Close bottom edges of all exterior doors with inverted end closure or end cap to provide channel to accept concealed automatic door bottom or seal.

- B. Door Edge Joint and Treatment: Joints at the edges of doors shall have manufacturer's standard edge construction with factory welded seam, filled and dressed smooth.
- C. Hardware Reinforcement: Provide steel plate reinforcement of the following minimum thickness fabricated from steel of same material as door faces. Coordinate with hardware schedule:
 - 1. Hinges: 7 gauge by 1-1/2 inch by length of hinge plus 6 inches minimum, securely welded to door edge with a minimum of 6 spot welds.
 - 2. High Frequency Hinges: 12 gauge channel, full length of door edge.
 - 3. Lock Faces and Flush Bolts: 12 gauge steel plate. Provide reinforcement at each door face for locks.
 - 4. All Other Surface Mounted Hardware: 12 gauge steel plate.
- D. Reinforce openings in doors for lites and vents on all sides with 14 gauge steel channel.
- E. Provide solid drip cap at top of exterior out-swinging doors.
- F. Provide non-egress double doors with one-piece Z-astagals of 14 gauge steel unless otherwise indicated or scheduled.
- G. Accurately mortise doors for locks and hinges. Provide adequate box type reinforcement with steel plates welded to the interior reinforcing channels and drilled and tapped. Provide reinforcement for all other items of hardware.
- H. Doors with glass lite openings shall have trim recessed from the face of the door, beveled and attached with screws.
- I. Louvers: Provide sightproof louvers inserted into the panels. Form louver frames of minimum 20-gauge steel. Weld or tenon minimum 24 gauge blades to frame and fasten the entire assembly to the door with moldings. The moldings, when used, shall be an integral part of the louver.
- J. Fire-Rated Doors: Provide fire rated doors investigated and tested as fire door doors, complete with type of hardware to be used. Identify each fire door with recognized testing laboratory labels, indicating applicable fire rating of steel doors. Doors required to meet smoke and draft control assembly requirements shall have labels that identify that the door has been tested and approved for smoke and draft control assemblies (S-label). Construct doors to comply with NFPA Standard No. 80 and UL-10(c).

2.04 FABRICATION - FRAMES

- A. Construct to shapes and sizes shown, meeting various wall thicknesses in accordance with ANSI/SDI-100.
- B. Fully Welded Frames: Continuously weld, fill, grind and dress smooth face frame miters. Continuously back-weld casing, stop, soffit and rabbit.
- C. Mortise, reinforce, drill and tap for standard weight, full mortise template hinges and template strike.
- D. Provide not less than three 18 gauge anchors per jamb, or as shown on Drawings, spaced for maximum stiffness. Provide adjustable 18 gauge floor clips at each jamb, welded to back face of jamb, punched for securing to floor with two spaced anchors.

- E. Make cutouts for required hardware specified under Section 08 71 00, from templates furnished. Reinforce butt cutouts with minimum 8 gauge thick steel plate drilled and tapped and welded in place. When heavy duty hinges are specified, provide high frequency reinforcing at frames for hinges. Coordinate with hardware vendor. Provide strike stops of frames with holes for three rubber door silencers; on double door frames, provide for two silencers per door at head.
 - 1. Hardware Reinforcement: Provide steel plate reinforcement of the following minimum thickness fabricated from steel of same material as frames. Coordinate with hardware schedule:
 - a. Hinge Cutouts: 7 gauge high frequency steel plate drilled and tapped and fully welded in place top and bottom. 7 gauge at intermediate locations.
 - b. Strikes and Flush Bolts: 12 gauge.
 - c. Surface Mounted Hold-Open Arms and Closers: 7 gauge
 - d. Exit Devices and Corner Reinforcement: 12 gauge
- F. For openings over 42 inches wide and at double openings, reinforce head members full length with a matching profile of 12 gauge steel. Provide anchor at midpoint of door, if practical.
- G. Construct frames for UL labeled doors in accordance with UL requirements and label as scheduled. Frames required to meet smoke and draft control assembly requirements shall have labels that identify that the frame has been tested and approved for smoke and draft control assemblies (S-label).
- H. Rain Drips: Provide rain drip at all exterior hollow metal door frames at exposed exterior walls whether scheduled in hardware sets or not.

2.05 FABRICATION TOLERANCES

- A. Allowable Tolerances for Fabrication: As specified in ANSI/SDI-117, Manufacturing Tolerances Standard Steel Doors and Frames.

2.06 PAINTING

- A. Bonderize and prime doors and frames with one shop coat of rust inhibitive primer.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install metal door frames plumb, level, rigid and in true alignment as recommended in SDI 105 and ANSI/DHI A115.IG, and the following:
 - 1. Cross Site Reveal: Not to exceed 3/16 inch as measured against stop of installed frames and doors. Doors and frames exceeding maximum allowed cross site reveal shall be removed and replaced at no additional expense to Owner.
- B. Install doors and fasten to maintain alignment with frames to achieve maximum operational effectiveness and appearance.
 - 1. Maintain clearances as specified in ANSI A250.8, 2.1.8.
 - 2. Shim as required per NFPA 80, ANSI/A115.IG and SDI 122.
- C. Fill backs of frames solid with mortar at concrete and masonry construction.
- D. Fill backs of frames with full thickness fiberglass batt insulation specified in Section 07 21 00, where indicated.

- E. Install fire doors and frames to comply with NFPA 80 and in accordance with Manufacturer's printed instructions.
- F. Prepare and install doors in accordance with ANSI A115 and SDI 122.

3.02 FIELD QUALITY CONTROL

- A. Manufacturer's certified door consultant shall inspect fire rated doors (including frames and hardware as a unit) and verify compliance with UL 10C (positive pressure testing) as required by 2006 IBC Section 714. Fire rated doors (including frames and hardware as a unit) which do not comply with UL 10C (positive pressure testing) as required by 2006 IBC Section 714 shall be removed and replaced at no additional cost to Owner.

3.03 CLEANING

- A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 08 14 00

WOOD DOORS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes the following:
 - 1. Solid core wood doors with wood veneer faces.
 - 2. Pre-fitting and pre-machining of wood doors.

1.02 SUBMITTALS

- A. Shop Drawings: Submit Drawings showing schedule of door sizes and types, door details and elevations. Note discrepancies between the Drawings and door schedules, and the requirements of regulatory and testing agencies.
 - 1. Submit confirmation of specified duty level in accordance with "Performance Duty Level" per WDMA Bulletin I.S.1A (04).
- B. Product Data: Submit Manufacturer's data showing door construction.
- C. Samples: Before fabrication, submit three (3) corner samples of each type of door to be furnished, showing face, edge, core construction and factory finish for each type specified.
- D. Fire Rated Doors:
 - 1. Installation Instructions: Door manufacturer shall clearly identify the frame, hardware products, other materials and work requirements necessary to maintain compliance with UL 10(c) (positive pressure testing) as required by 2006 IBC Section 715.
 - 2. Certification: Submit certification that fire rated doors (including doors, frames and hardware as a unit) will comply with UL 10(c) (positive pressure testing) as required by 2006 IBC Section 715.

1.03 QUALITY ASSURANCE

- A. Coordination: Contractor shall be responsible for coordinating and obtaining necessary information from Hardware and Metal Frame Manufacturers. Door Manufacturer shall be responsible for coordinating necessary information received by Contractor from Hardware and Metal Frame Manufacturers in order that doors shall be properly prepared to receive hinges and hardware. Contractor shall provide door supplier with approved frame schedule, hardware schedule, and hardware templates. Furnish to door supplier 60 days prior to desired delivery date of doors.
- B. Regulatory Requirements: Fire doors shall be listed and labeled by a nationally recognized testing and certification agency, in accordance with applicable building codes. Doors required to meet smoke and draft control assembly requirements shall have labels that identify that the door has been tested and approved for smoke and draft control assemblies (S-label). The listed doors shall meet or exceed ASTM E2074, UL-10(b), UL-10(c) (positive pressure testing), Category A and NFPA 252 (September 1999) with all requirements as part of door construction (no additional edge sealing required). Provide fire labels from Warnock-Hersey International (WHI), or Underwriters Laboratories (UL).

- C. Certification: Provide each fire rated and sound rated door with a label permanently attached at eye level, to the hinge stile or, where interfering hardware such as full length hinges are applied, in a location acceptable to the local Code Authority, indicating the testing agency's approval for the rating required. Do not cover or conceal label.
- D. Performance Duty Level: Provide doors with the following Performance Duty Level per WDMA Bulletin I.S.1A:
 - 1. Performance Duty Level: Heavy Duty.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Prior to delivery, provide protection compatible with factory finish specified for door edges and faces.
- B. Delivery:
 - 1. Deliver doors to the jobsite only when proper storage site is available.
 - 2. Store doors in an area having controlled temperature and humidity as recommended by the Window & Door Manufacturers Association (WDMA), AWI and the door manufacturer.
 - 3. Store doors flat on factory pallets, or three full 2 x 4's, one centered and the other two 12 inches from each end. Do not stack doors on end, or on their vertical edge.
 - 4. Protect wood doors from construction activity, dirt, and exposure to sunlight.
- C. Handling:
 - 1. Always handle doors with clean hands or gloves.
 - 2. Do not drag doors across one another.
 - 3. Maintain factory packaging or other means of protection on doors, until date of Substantial Completion.

1.05 WARRANTY

- A. Special Warranty: Furnish the following warranty to Owner:
 - 1. Warrant doors from the date of installation against defects in materials and workmanship. Periods of warranty after date of installation:
 - a. Interior solid core and mineral core: Life of installation.
 - 2. Replacement under warranty shall include removal of the defective door, hanging, installation of hardware, and finishing.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish doors of one of the following Manufacturers, except as approved otherwise by the Architect, subject to compliance with Specification requirements:
 - 1. Marshfield Door Systems www.marshfielddoors.com
 - 2. Algoma www.algomahardwoods.com
 - 3. Eggers Industries www.eggersindustries.com
 - 4. Lynden Door, Inc. www.lyndendoor.com
 - 5. Oshkosh Architectural Door Company www.oshkoshdoor.com
 - 6. Graham www.grahamdoors.com
 - 7. VT Industries, Inc. www.vtindustries.com

2.02 FLUSH DOORS

- A. Cores:
 - 1. Solid Core: Shall conform to ANSI A208.1 1LD2, 32 lbs. per cubic foot density. For doors scheduled to receive closers, provide minimum 5 inch solid wood top rail at doors with closers.
 - 2. Acoustical Core: Sound Transmission Class (STC) specified shall be certified by the Manufacturer to be based on tests conducted at an independent testing agency in accordance with ASTM E90 (90) and E413 (87) or later. Doors may qualify for fire label if specified. Provide acoustical core at doors to mechanical and equipment rooms and as otherwise scheduled.
 - 3. Provide supplemental hardwood blocking/reinforcement for locksets, closers, existing devices and other mortised and surface mounted hardware items. Through-bolt attachment is not allowed.
- B. Edge Bandings:
 - 1. Stiles (Dimensions given are minimum sizes allowed after factory trimming to booksize or prefitting).
 - a. Particleboard Core: 1-3/8 inch double banded laminated hardwood stile, laminated strand lumber or structural composite lumber (no finger joints allowed) in inner and outer band to be at least 1/4 inch wide same species lumber as face veneer with the exception of birch doors which will have hard maple stiles.
 - 2. Rails (Dimensions given are minimum sizes allowed after factory trimming to booksize or prefitting).
 - a. Particleboard Core: 1-1/8 inch minimum mill option hardwood rail.
- C. Face Veneers, Crossbands and Backers: When wood veneer or medium density overlay faces are specified, doors shall be 5 ply (AWI PC-5), made up of a face veneer, crossbanding and a core unit, all securely bonded together utilizing type 1 (fully waterproof) adhesive and the hot press assembly technique. All plies must be placed at right angles to adjacent plies. Face veneers shall have a minimum thickness of 1/50 inch after factory sanding and the individual pieces of veneer forming the face veneer must be spliced or edge glued together. Doors manufactured by cold-pressing 2 or 3-ply pre-manufactured door skins to multiple cores in the same press shall not be acceptable.
 - 1. Veneer, Cut and Match: AA Grade Birch, booked matched.
 - 2. Cross banding shall extend full width and height of door.
- D. Glue: Type 1 per WDMA TM-6 1998 (Adhesive Bond Durability Test Method).

2.03 LABELED FLUSH DOORS

- A. Mineral core flush veneered doors, 5-ply, shall be made up of face veneers, crossbanding, and a core unit securely bonded together utilizing Type I (fully waterproof) adhesive and the hot press assembly technique. Provide matching transom panels where scheduled.
- B. Core Unit: Asbestos free, noncombustible mineral composite with a minimum of 28 pounds per cubic foot) density when tested in accordance with ASTM C303, with 10 percent maximum absorption by weight with core in equilibrium at 90 percent relative humidity and 70 degrees F.. Provide flame resistant blocking as required by the hardware schedule. The door listing shall not limit the size or location of such blocking.
 - 1. Provide one lock block 5 inches x 12 inches when a bored unit or mortise lock is to be used and two lock blocks when the door is equipped with an exit device.
 - 2. For doors with closers include 5 inch top rail. Provide wide bottom rails for exit, manual and automatic flush bolts and automatic door bottoms.

- C. Face Veneers and Crossbanding: Same as specified for non-labeled doors.
- D. Rails: Top 1/2 inch minimum, bottom 1-1/2 inches minimum rail (one or two piece) of flame resistant material - salt free. Securely glue rails to core.
- E. Stiles: Manufacturer's standard for receiving a full mortise hinge. No salt treated components shall be used. UL or WH approved for labeled doors meeting the following performance criteria:
 - 1. 5/16 inch inner stile with 1/4 inch outer stile of matching hardwood, except on Birch, where Maple shall be used.
 - 2. Stiles to conform to "Extra Heavy Duty" WDMA Performance Standards.
- F. Vision Frames: Provide one of the following.
 - 1. Furnish metal vision frames primed for field painting for doors with lites. Frames shall meet AWI standard, UL, or WHI approved.
 - 2. Vision frames shall match vision frames in existing doors located in existing building adjacent to new remodeled areas.
 - 3. Provide Manufacturer's standard solid wood bead options for Architects approval. Provide Manufacturer's approved, veneer-wrapped wood bead for 45, 60 and 90 minute fire doors.
 - 4. Provide glass and glazing at all doors including fire doors. All doors are to be factory glazed. See Section 08 80 00 for glazing requirements.
- G. Manufacture labeled doors to the required size so as to provide proper clearances without field trimming. Machining of labeled doors must be completed before label is applied to assure the full thickness of the edge bands. Machine fire doors to meet NFPA 80 requirements. Provide channels for concealed exit devices specified in Section 08 71 00 and in conformance with UL requirements.
- H. Metal Edges: For pairs of fire doors, no metal edges are allowed. Doors must meet appropriate construction for fire rating without the use of metal at meeting stiles.

2.04 FACTORY FINISHING

- A. Provide either clear or stain finish as follows to match finish scheduled on Drawings or as selected by Architect:
 - 1. Stain Finish: WDMA TR-6, sheen shall be selected by Architect.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine door frames to assure that jambs are true and plumb. Correct frames which are not true and plumb before doors are hung.

3.02 INSTALLATION

- A. Doors shall be hung true and plumb with standard bevel and with uniform 1/8 inch clearance at jambs, head, and finished floor or threshold, unless otherwise required. Mortise, drill or otherwise prepare doors for finish hardware specified in Section 08 71 00, Finish Hardware. Pilot drill screw and bolt holes.
- B. Doors that are cut or planed for fitting shall be immediately resealed with a transparent wood sealer. Doors shall operate freely without sticking or binding, without hinge-bound conditions and with hardware installed, properly adjusted and functioning.

- C. Install fire doors and frames to comply with NFPA 80 and in accordance with manufacturer's printed instructions.
- D. Installation Tolerances:
 - 1. Maximum Diagonal Distortion (Warp): 1/4 inch (6 mm) measured with straight edge or taut string, corner to corner, over an imaginary 42 x 84 inch surface area.
 - 2. Maximum Vertical Distortion (Bow): 1/4 inch (6 mm) measured with straight edge or taut string, top to bottom, over an imaginary 42 x 84 inch surface area.
 - 3. Maximum Width Distortion (Cup): 1/4 inch (6 mm) measured with straight edge or taut string, edge to edge, over an imaginary 42 x 84 inch surface area.
 - 4. Cross Site Reveal: Not to exceed 3/16 inch as measured against stop of installed frames and doors. Doors and frames exceeding maximum allowed cross site reveal shall be removed and replaced at no additional expense to Owner.
- E. Repair of Factory Finish - Clear and Stain: Minor handling marks or scratches (not through the seal coat) shall be repaired by sanding the damaged area, then topcoating again with polyurethane with a matching gloss.
- F. Adjusting: Adjust doors for smooth and balanced door movement.

3.03 CLEANING

- A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 08 31 13

ACCESS DOORS AND FRAMES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes standard steel and stainless steel construction access doors and frames.

1.02 SUBMITTALS

- A. Shop Drawings: Submit Drawings showing sizes, proposed locations, construction and installation details.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.
- B. Storage and Protection: Deliver and store items in dry, protected areas. Adequately protect against damage while stored at the site.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Steel Framed Access Doors and Frames: Furnish products of one of the following Manufacturers, except as approved by the Architect, subject to compliance with Specification requirements:
 - 1. Babcock-Davis (Cierra Products) www.babcockdavis.com
 - 2. Nystrom Building Products www.nystrom.com
 - 3. Karp Associates www.karpinc.com
 - 4. J.L. Industries www.jlindustries.com
 - 5. Milcor Inc. www.milcorinc.com

2.02 ACCESS DOORS

- A. Steel and Stainless Steel Doors: Sizes as shown on the Drawings. Units shall be prime painted steel at painted wall construction and stainless steel in tile and other locations as indicated, in types as required by wall construction, as follows (based on Babcock-Davis):
 - 1. Non-Rated Access Panels:
 - a. Drywall Walls and Ceilings:
 - 1) Public Spaces: Babcock-Davis B-RW recessed access panel with concealed pivoting rod hinge.
 - 2) Storage, Mechanical, Utility and Similar Spaces: Babcock-Davis B-NW access panel.
 - b. Tile Walls and Similar: Babcock-Davis B-NT access pane
 - c. Acoustical Tile: Babcock-Davis B-RA access panel.
 - 2. Fire-Rated Access Panels:
 - a. Drywall Walls and Ceilings: Babcock-Davis B-IW, Insulated, Fire-Rated access panel.

- B. Steel Framed Door and Frame: 16 gauge steel. Provide key operated cylinder lock with additional screw driver operated cam locks in sufficient quantity as recommended by manufacturer to hold door in flush closed position. 16 gauge steel shall be used for door and frame. Type K door shall have concealed spring hinges to allow door to open a minimum of 175 degrees. Size as required or as indicated on the Drawings.
- C. Sizes and Locations: Provide doors in quantities and sizes necessary for access to valves, dampers and other devices or equipment requiring periodic access, including locations indicated on drawings (if any).

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install access doors in accordance with Manufacturer's directions at locations shown on Drawings or necessary for access to valves, dampers and other devices or equipment requiring periodic access. Do not install panels in locations where frame will extend over transition between two separate wall or ceiling finish materials (i.e. tile to gypsum board).
- B. Install plumb and level, true to line.

3.02 CLEANING

- A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 08 36 13

SECTIONAL OVERHEAD DOORS

PART 1 GENERAL

1.01 DESIGN / PERFORMANCE REQUIREMENTS

- A. Performance Requirements: Design doors to meet windload of 20 psf.
- B. Single-Source Responsibility: Provide doors, tracks, motors, and accessories from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.

1.02 SUBMITTALS

- A. Shop Drawings: Submit Drawings indicating type of doors, operation, finishes and installation details.
- B. Samples: Submit 2 samples showing specified finish.
- C. Manufacturer's Product Data. Submit data showing door construction, assembly, materials and other pertinent information.

1.03 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in performing Work of this section with a minimum of five years experience in the fabrication and installation of security closures.
- B. Installer Qualifications: Installer Qualifications: Company specializing in performing Work of this section with minimum three years and approved by manufacturer.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.
- B. Storage: Adequately protect against damage while stored at the site.
- C. Handling: Comply with Manufacturer's instructions.

1.05 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.

1.06 COORDINATION

- A. Coordinate Work with other operations and installation of adjacent materials to avoid damage to installed materials.

1.07 WARRANTY

- A. Provide manufacturer's standard 10 year warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the following Manufacturers, or as otherwise approved by Architect, subject to compliance with Specification requirements:
 - 1. Overhead Door Corp. www.overheaddoor.com
 - 2. Ceco/Windsor Door www.cecodoor.com
 - 3. Clopay Corp. www.clopaydoor.com
 - 4. Raynor www.raynor.com
- B. Basis of Design: Overhead Door Model 426 insulated sectional overhead doors as manufactured by Overhead Door Corporation.

2.02 INSULATED STEEL OVERHEAD DOORS

- A. Insulated Steel Sectional Overhead Doors: 426 Series Insulated Steel Doors by Overhead Door Corporation. Units shall have the following characteristics:
 - 1. Door Assembly: Insulated steel door assembly with rabbeted meeting rails to form weathertight joints and provide full-width interlocking structural rigidity.
 - a. Panel Thickness: 2 inches.
 - b. Exterior Surface: Ribbed.
 - c. Exterior Steel: 24 gauge, hot-dip galvanized.
 - d. Back Cover: 26 gauge steel.
 - e. Center and End Stiles: 16 gauge steel.
 - f. Springs: 25,000 cycles.
 - g. Insulation: Polystyrene, R-value of 7.35; U value of 0.136.
 - 2. Finish: Two coat baked-on polyester with white exterior and white interior color.
 - 3. Windload Design: ANSI/DASMA 102 to meet applicable codes and standards.
 - 4. Hardware: Galvanized steel hinges and fixtures. Ball bearing rollers with hardened steel races.
 - 5. Lock: Tumbler keyed lock, interlocked with motor operator.
 - 6. Weatherstripping:
 - a. Flexible bulb-type strip at bottom section.
 - b. Flexible Jamb seals.
 - c. Flexible Header seal.
 - 7. Track: Provide track as recommended by manufacturer to suit loading required and clearances available.
- B. Electric Motor Operation: Provide UL listed electric operator, size and type as recommended by manufacturer to move door in either direction at not less than 2/3 foot nor more than 1 foot per second. Operator shall meet UL325/2010 requirements for continuous monitoring of safety devices.
 - 1. Entrapment Protection: Required for momentary contact, includes radio control operation.
 - a. Photoelectric sensors monitored to meet UL 325/2010.
 - 2. Operator Controls:
 - a. Push-button and key operated control stations with open, close, and stop buttons.
 - b. Surface mounting.
 - c. Interior location.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions:
 - 1. Do not begin installation until openings have been properly prepared.
 - 2. Verify wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.
 - 3. Verify electric power is available and of correct characteristics.
 - 4. Notify Architect of unsatisfactory preparation before proceeding.
 - 5. Commencement of Work will be construed as acceptance of subsurfaces.

3.02 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.

3.03 INSTALLATION

- A. Doors are to be installed by the Manufacturer or authorized representative in strict accordance with Manufacturer's printed instructions.
- B. Install overhead doors and track in accordance with approved shop drawings and the manufacturer's printed instructions.
- C. Coordinate installation with adjacent work to ensure proper clearances and allow for maintenance.
- D. Anchor assembly to wall construction and building framing without distortion or stress.
- E. Securely brace door tracks suspended from structure. Secure tracks to structural members only.
- F. Fit and align door assembly including hardware.
- G. Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.
- C. Upon completion of installation, including Work by other Trades, lubricate, test and adjust doors to operate easily, free from warp, twist or distortion and fitting weathertight for entire perimeter.

3.04 CLEANING AND ADJUSTING

- A. Adjust door assembly to smooth operation and in full contact with weatherstripping.
- B. Clean doors, frames and glass.
- C. Remove temporary labels and visible markings.
- D. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

3.05 PROTECTION

- A. Do not permit construction traffic through overhead door openings after adjustment and cleaning.
- B. Protect installed products until completion of project.
- C. Touch-up, damaged coatings and finishes and repair minor damage before Substantial Completion.

END OF SECTION

SECTION 08 44 00

GLAZED ALUMINUM CURTAIN WALLS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Glazed aluminum curtain walls and aluminum entrance doors.
- B. Related Sections:
 - 1. Section 08 80 00 - Glazing.

1.02 SYSTEM DESCRIPTION

- A. Design responsibility:
 - 1. The contract documents define design intent and performance requirements.
 - 2. Details show preferred profiles. Window wall framing system shall provide for flush retained glazing on all sides without projecting stops, with glass offset toward the front (exterior) of the frame, unless otherwise indicated on Drawings or selected by Architect.
 - 3. The Contractor is charged with total responsibility for design, structural calculations, Shop Drawings, fabrication, installation, warranties, certifications and related documentation.
- B. Performance Requirements – Curtain Wall:
 - 1. Air Infiltration: provide glazed aluminum curtain wall system with permanent resistance to air leakage through system of not more than 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a static air-pressure difference of 6.24 psf.
 - 2. Water Penetration Under Static Pressure: Provide glazed aluminum curtain wall system that does not evidence water leakage when tested according to ASTM E 331 at minimum differential pressure of 20 percent of inward acting wind-load design pressure as defined by ASCE 7, "Minimum Design Loads for Buildings and Other Structures," but not less than 10 psf.
 - 3. Water Penetration Under Dynamic Pressure: Provide glazed aluminum curtain wall system that does not evidence water leakage when test according to AAMA 501.1 at minimum differential pressure of 20 percent of inward acting wind load design pressure as defined by ASCE 7, "Minimum Design Loads for Buildings and Other Structures," but not less than 10 psf.
 - 4. Structural Requirements:
 - a. Wind loads: Provide glazed aluminum curtain wall system, including anchorage, capable of withstanding wind load design pressures calculated according to requirements of authorities having jurisdiction or the American Society of Civil Engineers ASCE 7, "Minimum Design Loads for Buildings and Other Structures, '6.4.2,' Analytical Procedure," whichever are more stringent.
 - b. Deadloads: Provide glazed aluminum curtain wall system members that do not deflect an amount which will reduce glazing bite below 75 percent of design dimension when carrying full deadload. Provide a minimum 1/8 inch clearance between members and top of fixed panels, glazing, or other fixed part immediately below. Provide a minimum 1/16 inch clearance between members and operable windows and doors.

- c. Thermal Movement: Provide glazed aluminum curtain wall system, including anchorage, that accommodates thermal movements of systems and supporting elements resulting from the following maximum change (range) in ambient and surface temperatures without buckling, damaging stresses on glazing, failure of joints sealants, damaging loads on fasteners, noise or vibration, and other detrimental effects.
 - 1) Temperature Change (Range): 120 degrees F, ambient; 180 degrees F, material surfaces.
 - d. Live Loads: Provide glazed aluminum curtain wall system, including anchorage, that accommodates supporting structure's deflection from uniformly distributed and concentrated live loads indicated without failure of materials or permanent deformation.
 - e. Structural Support Movement: Provide glazed aluminum curtain wall system that accommodates structural movements including, but not limited to, sway, twist, column shortening, long term creep, and deflection.
 - f. Seismic Loads: Provide glazed aluminum curtain wall system, including anchorage, capable of withstanding the effects of earthquake motions calculated according to requirements of authorities having jurisdiction or ASCE 7, "Minimum Design Loads for buildings and other Structures," Section 9, "Earthquake Loads," whichever are more stringent.
 - 5. Deflection:
 - a. Limit deflection to $L/175$ with a maximum of 3/4 inch when subjected to 25 psf wind load design pressure acting inward and outward.
 - b. System shall not deflect more than 1/8 inch at the center point of a horizontal member, or more than 1/16 inch at the center of members located directly above operable doors and windows, once deadload points have been established.
 - 6. Thermal Frame Construction:
 - a. Condensation Resistance: Provide glazed aluminum curtain wall system with condensation-resistance factor (CRF) of not less than 55 when tested according to AAMA 1503.1.
 - b. Average Thermal Conductance: Provide glazed aluminum curtain wall system with an average u-value of not more than 0.66 BTU/sq. ft. x h x degree F. when tested according to AAMA 1503.1.
 - 7. Dimensional Tolerances: Provide glazed aluminum curtain wall system, including anchorage, that accommodates dimensional tolerances of building frame and other adjacent construction.
- C. Performance - Aluminum Doors (Swinging): Resistance to corner racking shall be tested by the Dual Moment Load test as follows:
- 1. Test section shall consist of standard top door corner assembly. Side rail section shall be 24 inches (600mm) long and top rail section 12 inches long.
 - 2. Anchor "top rail" positively to test bench so that corner protrudes 3 inches beyond bench edge.
 - 3. Anchor a lever arm positively to side rail at a point 19 inches from inside edge of top rail. Attach weight support pad at a point 19 inches from inner edge of side rail.
 - 4. Test section shall withstand a minimum load of 200 pounds on the lever arm before reaching the point of failure, which shall be considered a rotation on the lever arm in excess of 45 degrees.

- D. The drawings indicate the size, profiles, and dimensional requirements of the curtain wall system. Other curtain wall systems having equal performance characteristics may be considered provided deviations in dimensions and profiles are minor and do not change the design concept or intended performance as judged by the Architect, the burden of proof of equality is on the proposer.

1.03 SUBMITTALS

- A. Submit product data, shop drawings and samples in accordance with Section 01 33 00.
1. Product Data: Submit 2 copies of Manufacturer's Specifications, recommendations and standard details for aluminum doors, curtain wall frames and components of the Work. Include manufacturer's installation manual.
 2. Shop Drawings:
 - a. Include wall elevations and details with seal and signature of engineer registered in the state where the project is located.
 - b. Test reports: In accordance with specified test methods.
 - c. Structural calculations with seal and signature of engineer registered in the state where the project is located or in lieu thereof a tested system.
 - d. Warranty: agreeing to repair or replace defective material within warranty period.
 - e. Certificates that system meets requirements.
 3. Samples: Submit 3 samples of each required aluminum finish.
 4. Test reports: Aluminum curtain walls: Furnish certified test reports verifying that the system being submitted has been previously tested and meets the specified performance criteria. Test reports are not to be considered as a substitution for engineer calculations required elsewhere.

1.04 QUALITY ASSURANCE

- A. Standards: Except as otherwise indicated, the requirements for aluminum doors and curtain wall frames, and the terminology used in this Section, are those of NAAMM, AAMA and AA and in particular, those of the "Entrance Manual" by NAAMM.
- B. Regulatory Requirements:
1. ANSI A117.1, 2009 "Accessible and Usable Buildings and Facilities."
 2. Public Law 101-336 "The Americans with Disabilities Act of 1990 (ADA)."
 3. 2010 ADA Accessibility Guidelines (ADAAG).
 4. The Arizonans with Disabilities Act of 1992 Administrative Rules (AzDAAG)
- C. Testing Agency:
1. Construct test panel and conduct tests as specified herein at a location and under the direction of a testing agency acceptable to the Architect. Conduct tests in the presence of the Owner, Architect, Contractor and other interested parties.
 - a. Tests for air infiltration and water penetration under static pressure after cycled temperature and structural performance test.
 - b. Test for structural performance at 1.5 times maximum design load.
 2. Testing Agency will be responsible for conducting and interpreting the tests; inspecting fabrication facilities and operations; inspecting installation; will state in each report whether or not the Work complies with the requirements of the Contract Documents, will specifically note deviations therefrom, and will indicate corrective measures required and taken.
 3. Architect may waive any or all tests provided the curtainwall manufacturer can furnish certified test reports by an acceptable testing laboratory showing the curtainwall as indicated and specified have been previously tested and have met or exceeded the specified performance requirements.

- D. Single Source Responsibility: Obtain entrance, storefront, and curtain wall, including finishes, used for this project through one source from a single manufacturer.

1.05 PROJECT/SITE CONDITIONS

- A. Field Measurements:
 - 1. Whenever possible, check the actual openings in the construction Work by accurate field measurement before fabrication, and show recorded measurements on final shop drawings.
 - 2. Coordinate fabrication schedule with construction progress as directed and avoid delays of the Work.
 - 3. Where necessary, proceed with fabrication without field measurement, and coordinate installation tolerances to ensure proper fit of units.
- B. Environmental requirements: Do not install materials during inclement weather or when the temperature is below the minimum recommended by the manufacturer. Do not install sealants when extreme temperature conditions or heavy winds are predicted during the period of initial cure.

1.06 WARRANTY

- A. Warrant entire system of glazed aluminum curtain walls against leaks or other defects for a period of two (2) years.
 - 1. Defective materials and workmanship are hereby defined to include, but are not limited to, evidence of:
 - a. Penetration of water into the building through fixed glazing and framing components.
 - b. Air infiltration exceeding specified limits.
 - c. Structural failure of components resulting from forces within specified limits.
 - d. Failure of insulated glass units.
 - e. Cracking, crazing, flaking, of coatings or opacifiers on glass.
 - f. Secondary glass damage and/or damage due to falling components.
 - g. Adhesive or cohesive failure of sealant.
 - h. Crazing on surface of non-structural sealant.
 - i. Non-structural sealant hardening beyond Shore A durometer 50 or softening below 20.
 - j. Failure of operating parts to function normally.
- B. Warrant aluminum finish against excessive fading, excessive non- uniformity of color or shade, cracking, peeling, pitting or corroding (all within the limits defined). Warranty shall include replacement at no charge (material and labor) for a period of five (5) years beginning on the date of final acceptance.
- C. Upon notification of defects within the warranty period, make the necessary repairs and replacements at the convenience of the Owner. Repairs and replacements shall include resultant damage to adjacent materials, systems and equipment.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the following manufacturers, except as otherwise approved by the Architect, subject to compliance with specifications requirements:
 - 1. Arcadia, Inc. www.arcadiaproducts.com
 - 2. EFCO www.efcocorp.com
 - 3. Kawneer Co. www.kawneer.com
 - 4. Oldcastle Glass Engineered Products www.oldcastleglass.com

2.02 MATERIALS: ALUMINUM CURTAIN WALL

- A. Framing members, transition members, mullions, adapters, and mountings: Extruded 6063 T5 aluminum alloy (ASTM B221 - Alloy G.S. 10aT5).
- B. Screws, miscellaneous fastening devices, and internal components:
 - 1. Typical: Aluminum, stainless steel, or zinc plated steel in accordance with ASTM A-164. Perimeter anchors shall be aluminum or steel, providing the steel is properly isolated from the aluminum.
 - 2. Fasteners: Stainless steel type 300 series, selected to prevent galvanic action with the components fastened. Where exposed in finished surfaces, use oval-head counter-sunk cross-headed screws with head diameter one screw size smaller than the shank diameter and color to match adjacent surfaces by the Kaldur process, Black Magic process, or resinous coating finish as applicable.
- C. Glazing Gaskets: Neoprene or EPDM and silicone compatible. PVC glazing gaskets are not acceptable.
 - 1. Exterior: Cellular sponge, 40 +/- 5 Shore A durometer, complying with ASTM C509, with molded corners.
 - 2. Interior: Non-cellular dense, 75 +/- 5 Shore A durometer, complying with ASTM C864, option 1 or 2, with molded corners.
 - 3. Bed all gasket corners, molded or not in elastomeric silicone sealant.
- D. Steel Sections: ANSI/ASTM A36; shaped to suit mullion sections.
 - 1. Shop prime all steel components with zinc oxide, alkyd primer, high-solids content, conforming to SSPC-Paint 25.1.
- E. Shop and Touch-Up Primer for Steel Components: SSPC-Paint 25.1.
- F. Touch-Up Primer for Galvanized Steel Surfaces: SSPS 20, zinc rich type.
- G. Glass: As specified in Section 08 80 00.
- H. Sealant: Silicone sealant in accordance with Section 07 92 00.
- I. Steel angles, plates, bars, rods and other steel accessories required to join or reinforce assembly of aluminum components: ASTM A 36 and ASTM A 283, hot dipped galvanized after fabrication. Use separators where galvanized components are not compatible with other components.
- J. Aluminum angles, plates, bars, and other aluminum members required to join or reinforce assembly of aluminum components: Alloys recommended by manufacturer or fabricator to develop required strength of assembly.

2.03 COMPONENTS

- A. Sizes and Profiles: The required sizes for doors and curtain wall frame units, and profile requirements, are shown.

2.04 FABRICATION

A. General

1. Weld by methods recommended by the Manufacturer and AWS to avoid discoloration at welds.
2. Grind exposed welds smooth and restore mechanical finish.
3. Remove arrises from cut edges and ease edges and corners to a radius of approximately 1/64 inch.
4. Conceal fasteners, wherever possible, except as otherwise shown.
5. Maintain continuity of line and accurate relation of planes and angles.
6. Provide secure attachment and support at mechanical joints, with hairline fit of contacting members.
7. Reinforce the Work as necessary for performance requirements, and for support to the structure.
8. Separate dissimilar metals with bituminous paint or preformed separators which will prevent corrosion.
9. Separate metal surfaces at moving joints with non-metallic separators to prevent "freeze-up" of joints.

B. Curtain wall frames:

1. Fabricate tubular assemblies as shown, with either welded or mechanical joints in accordance with Manufacturer's standards, with concealed fasteners wherever possible.
2. Provide members of the size, shape, and profile shown on Drawings, based on Oldcastle 10-1/8 inch reinforced vertical stiles and 7-1/4 inch horizontal mullions.
3. Fabricate frames Manufacturer's standard rigid polymer for vertical sections and silicone compatible elastomer thermal break separator at horizontal sections. Thermal break shall be designed in accordance with AAMA TIR-A8 and tested in accordance with AAMA 505.
4. Reinforce internally with steel channel shapes as shown, or as necessary to support the required loads.
5. Weatherstripping: Provide compression weatherstripping on door-contact face of door stops on exterior door frames and/or other frames where indicated.
6. Glass framing members shall provide for flush glazing with through sight lines, without projecting stops for specified glass thickness.
7. Provide glazing system for frames to receive lights. Design system for replacement of glass from either interior or exterior as required and as applicable to project requirements.
8. System shall provide resilient settings for glass by use of elastomeric extrusions as required to provide specified performance. PVC glazing gaskets are not acceptable.
9. Fabricate curtain wall frame assemblies for exterior walls with flashing and weeps to drain penetrating moisture to exterior.
10. Provide anchorage and alignment brackets for concealed support of assembly from the building structure.
11. Allow for thermal expansion of exterior units.
12. Include flashings in conjunction with components as detailed, finished to match.

C. Doors (Swinging):

1. Materials: Sections shall be extruded for 6063-T5 aluminum alloy (ASTM B221 - Alloy G.S. 10A T5).

2. Fasteners, where exposed, shall be aluminum, stainless steel or plated steel. Perimeter anchors shall be aluminum or steel, providing the steel is properly isolated from the aluminum.
 3. Glazing gaskets shall be TPE or EPDM elastomeric extrusions.
 4. Major portions of the door stiles shall be 0.125 inch in thickness and glazing molding shall be 0.050 inch thick.
 5. Construction: Provide the following, unless otherwise indicated on Drawings.
 - a. Wide Stile:
 - 1) Vertical Stile: 5 inches.
 - 2) Top Rail: 5 inches.
 - 3) Bottom Rail: 10 inches
 - b. Thickness of stiles and rails: 1-3/4 inches.
 - c. Corner construction: Fillet weld and mechanical clip fastening.
 6. Door shall be weatherstripped on 3 sides with metal-backed pile cloth installed in door and/or frame. Provide an integral adjustable (uninterrupted) dual weathering at meeting stiles of pairs of doors.
 7. Hardware: Provide the following items:
 - a. Weatherstrip and Door Bottom/Sweep: Aluminum Door Manufacturer's standard.
 - b. Balance of Hardware: As specified in Section 08 71 00.
- D. Hardware Installation at Factory:
1. Cut, reinforce, drill and tap curtain wall frames as required to receive hardware except do not drill and tap for surface-mounted items until the time of installation at the Project Site. Comply with Hardware Manufacturer's instructions and template requirements. Use concealed fasteners wherever possible.
 2. Install hardware, except surface-mounted hardware, at fabrication plant. Remove only as required for final finishing operations, and for delivery and installation of the Work at the Project Site.
- E. Flashings and Miscellaneous Trim:
1. Provide interior sills, exterior sill (or subsills) with end dams, closures, flashings, break metal covers, trim and other elements in conjunction with or adjacent to curtain wall system as required for watertightness and aesthetics. If sill frame does not provide means for conducting water out of the aluminum frame systems, then suitable flashings to ensure that water is conducted out of system shall be provided. Provide water diverters at ends of the horizontal mullion glazing pockets to drain water down the vertical mullion/hamb glazing pockets to sill can or flashing.
 2. Fabricate miscellaneous trim from 0.060-inch-thick minimum aluminum (break metal) finished to match other components, except fabricate interior and exterior sills (or subsills) from 0.075-inch-thick minimum extruded aluminum (unless the sill or subsill is supporting the weight of the system and then a 0.125-inch thick minimum extruded aluminum shall be provided).
 3. Flashings and sill can, in conjunction with mechanically fastened end dams and/or water diverters shall direct water entering the system to the outside of the building and shall not depend solely upon sealants.
- F. Aluminum Finishes:
1. Prepare the aluminum surfaces for finishing in accordance with the aluminum producer's recommendations and standards of the finisher or processor.
 2. Process components of each assembly in a manner to attain complete uniformity of color.
 3. Finish: Clear anodized, Architectural Class II anodic coating conforming to Aluminum Association Designation AA-M-12 C22 A31.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.
 - 1. Coordinate curtain wall work with the work of other Sections and provide items to be placed during the installation of other work at the proper time to avoid delays. Place such items, including inserts and anchors, accurately in relation to the final location of curtain wall components.

3.02 PREPARATION

- A. Field Measurements: Take field measurements prior to preparation of Shop Drawings and fabrication, where possible, to ensure proper fitting of the Work. Allow for trimming and fitting wherever the taking of field measurements before fabrication might delay the Work.

3.03 INSTALLATION

- A. Comply with Manufacturer's Specifications and recommendations for the installation of glazed aluminum curtain wall frames.
 - 1. Furnish necessary material, labor, and equipment for the complete installation of the following: glass framing, vertical and horizontal mullions, transitional members connecting these components, adapters and mountings for trim moldings and facing materials.
 - 2. Set units plumb, level and true in line, with uniform joints and without warp or rack of curtain wall frames, doors or panels.
 - 3. Shim and brace aluminum system before anchoring to structure.
 - 4. Anchor securely in place, allowing for required movement, including expansion and contraction.
 - 5. Separate aluminum and other corrodible metal surfaces from sources of corrosion or electrolytic action at points of contact with other materials.
 - 6. Set sill members and other members in a bed of compound as shown, or with joint fillers or gaskets as shown to provide weathertight construction.
 - 7. Support on metal shims and secure in place by bolting to clip angles and similar supports anchored to supporting structure.
- B. Comply with Section 07 92 00 for sealants, compounds, fillers and gaskets to be installed integrally with door and curtain wall frames.
 - 1. Seal joints in curtain wall in a concealed manner, unless exposed sealant is indicated.
 - 2. Seal perimeter members as shown on Manufacturer's installation instructions or as required for unique job conditions. Set other members with internal sealants and baffles as called for in Manufacturer's installation instructions.
 - 3. Coordinate installation of perimeter sealant and backer materials between assemblies and adjacent construction in accordance with requirements of Section 07 92 00.
- C. Comply with Section 08 80 00 and Curtain Wall Manufacturers printed instructions for installation of glass shown to be glazed into curtain wall frames.

- D. Dimensions indicated are based on an assumed design temperature of 70 degrees F. Take into account the ambient temperature range at the time of fabrication and erection.
- E. Cut and trim component parts of the curtain wall during erection only with the approval of the manufacturer or fabricator and in accordance with his recommendations. Do not cut through reinforcing members. Restore finish completely to protect material and remove evidence of cutting and trimming. Remove and replace members where cutting or trimming has impaired strength or appearance.
- F. Do not erect members which are warped, bowed, deformed or otherwise damaged to such extent as to impair strength or appearance. Remove and replace members damaged in the process of erection.

3.04 TOLERANCES

- A. Maximum Variation from Plumb: 0.06 inches every 3 feet non-cumulative or 0.5 inches per 100 feet, whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.05 FIELD QUALITY CONTROL

- A. Water Penetration Test: After completion of the installation and nominal curing of sealants and glazing compounds, test the curtain wall for water leaks in accordance with "Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls and Sloped Glazing Systems ", AAMA Standard 501.2-03. Provide written certification that installed curtain wall framing systems pass. Correct deficiencies observed as a result of this test.

3.06 ADJUSTING AND CLEANING

- A. Clean aluminum surfaces promptly after installation of curtain wall frames, exercising care to avoid damage of the protective coating.
- B. Remove excess glazing and sealant compounds, dirt, and other substances.
- C. Adjust doors for smooth operation.
- D. Mark glazed areas immediately upon installation. Use streamers or ribbons suitably attached to framing and held free of the glass. Do not apply warning markings directly to the glass.
- E. Protect glass and glazing materials during the construction period so that they will be without any damage or deterioration at the time of acceptance by the Owner. Cover glass as required to protect it from welding, sandblasting and other activities that might damage the surfaces.
- F. Remove and replace glass which is broken, cracked, chipped or damaged in any way and from any source, including weather, vandalism or accidents during the construction period.
- G. Maintain glass in a reasonably clean condition during construction so that it will not become stained and will not contribute to the deterioration of glazing materials. Conduct a systematic inspection program not less than once a month for installed glass. Clean as required to meet above requirements.

- H. Wash glass on both faces not more than 4 days prior to acceptance by the Owner. Comply with instructions and recommendations of the glass manufacturer and glazing materials manufacturer for cleaning in each case.

END OF SECTION

SECTION 08 71 00

DOOR HARDWARE

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Hardware and related items for interior and exterior doors, other than specified in specific door sections.

1.02 SYSTEM DESCRIPTION

- A. Performance Requirements: The Manufacturer or Authorized Distributor shall confirm that there is an established local agency which stocks a full complement of parts and offers service during normal working hours for the finish hardware to be furnished and that the agency will supply parts without delay and at reasonable cost.
- B. Furnish hardware items of proper design for use in doors and frames of the thicknesses, profile, security and similar requirements indicated, as necessary for proper installation and function, regardless of omissions or conflicts in the information in the Contract Documents.

1.03 SUBMITTALS

- A. Submit shop drawings and product data of each type of hardware required for Project, in accordance with Section 01 33 00. Indicate the following:
 - 1. Style and finish.
 - 2. Locations and mounting heights of each item of hardware. Use established numbering system.
 - 3. Include a complete listing of equipment and materials including manufacturer, catalog number, finish, diagrams, (including cut-sheets), schematics and all other pertinent data.
- B. Templates: Supply to Door and Frame Manufacturer(s) to enable proper and accurate sizing and locations of cutouts for hardware.
- C. Certification:
 - 1. At the completion of installation, certify that material is properly installed according to Manufacturers printed instructions.
 - 2. Submit certification that hardware for fire rated doors (including doors and frames as a unit) will comply with UL 10C (positive pressure testing) as required by 2006 IBC Section 715.
- D. Operating and Maintenance Data: Submit in accordance with Section 01 77 00. Provide Owner with Manufacturer's parts list and maintenance instructions for each type of hardware supplied and necessary wrenches and tools required for proper maintenance of hardware.

1.04 QUALITY ASSURANCE

- A. Standards: Comply with the following:
 - 1. ANSI/NFPA 80 - Fire Doors and Windows.
 - 2. UL Standard 305 - Panic Hardware.

B. Regulatory Requirements:

1. Comply with the following:
 - a. ANSI A117.1, 2009 "Accessible and Usable Buildings and Facilities."
 - b. Public Law 101-336 "The Americans with Disabilities Act of 1990 (ADA).
 - c. 2010 ADA Accessibility Guidelines (ADAAG).
 - d. The Arizonans with Disabilities Act of 1992 Administrative Rules (AzDAAG)
2. Hardware listed or furnished shall meet requirements of Federal, State and Local codes having jurisdiction.
3. Any item furnished or installed that does not meet code requirements shall be removed and proper items substituted at no additional cost or expense to the Owner.
4. Provide hardware for fire-rated openings in compliance with A.I.A. (NBFU) Pamphlet No. 80 and NFPA Standards No. 80 and No. 101 and UL 10(c) (positive pressure testing). This requirement shall take precedence over other requirements for such hardware.
5. Provide hardware which has been tested and listed by U.L. for the types and sizes of doors required, and which complies with the requirements of the doors and door frame labels.
6. Provide 3-point latches at aluminum double doors used as entrance, not egress exit.
7. Hardware on all doors leading to or from electrical rooms, mechanical rooms, service stairs, dock areas and the like which represent a hazard to the blind, shall have knurling or abrasive coating on the door lever, handle, or bar which will alert the user to potential perils present. The hardware product and installation shall satisfy all governing handicapped codes.

C. Supplier Qualifications:

1. Employ an AHC member of the DHI.
2. Factory authorized stocking distributor of the approved items.
3. Holder of legally required licenses.

D. Manufacturer Qualifications: 5 years experience in manufacture of comparable systems.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Package each item of hardware in original and individual containers, complete with all necessary fastenings, keys, instructions, and templates for spotting mortising tools.
1. Mark each container with its item number corresponding to the item number on the finish hardware schedule.
 2. Containers holding locks shall show the following corresponding to that shown on the finish hardware schedule:
 - a. Heading number
 - b. Door number
 - c. Hand of door (when required)
 - d. Keying symbol (developed by Owner)
 3. A typewritten schedule in DHI format conforming with the approved schedule shall accompany each shipment.
- B. When hardware must be installed at the factory, the hardware supplier shall send all such needed items to the respective supplier for their use in installation. The cost of this shipping requirement shall be borne by the hardware supplier.
- C. Acceptance at Site: Upon delivery of the finish hardware to the job site, check in and sign for all material delivered and thereafter be responsible for same.

- D. Storage and Protection: Provide a secured area with sufficient space and shelving in which to store and inventory all materials under lock and key. Protect hardware from damage at all times.

1.06 WARRANTY

- A. Warranty hardware against defects in materials and workmanship for 2 years. Repair, replace or otherwise correct deficient materials at no additional cost to Owner.
 - 1. Locksets: 3 year warranty.
 - 2. Closers: 10 year warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Products equaling or exceeding quality requirements of the specified product as manufactured by the following are acceptable:
 - 1. Butts: Hager www.hagerhinge.com , Ives: www.iveshardware.com , Stanley www.stanleyhardware.com ,
 - 2. Exit Device VonDuprin www.vonduprin.com
 - 3. Locksets: BEST www.besthdw.com , Marks www.marksusa.com
 - 4. Closers: LCN www.lcnclosers.com
 - 5. Thresholds, Door Bottoms, Weatherstripping: Pemko www.pemko.com , Hager www.hagerhinge.com ,
 - 6. Stops, Kickplates, Pulls, Push Plates: Ives www.iveshardware.com , Trimco www.trimcobbw.com , Hager www.hagerhinge.com.
 - 7. Pocket Door Hardware: Hager www.hagerco.com, Stanley www.stanleyworks.com , Grant.
 - 8. Overhead Concealed Closers: LCN www.lcnclosers.com, Dorma www.dorma-usa.com.
 - 9. Coordinators and Automatic Flush Bolts: Ives, www.iveshardware.com Trimco www.trimcobbw.com, Hager www.hagerco.com.
 - 10. Push/Pull Latches: Glynn Johnson www.glynn-johnson.com , ABH www.abhmfg.com , Trimco www.trimcobbw.com
 - 11. Digital Locks: Locknetics www.locknetics.com , Unican www.ilcounican.com.
- B. To the greatest extent possible, obtain all finish hardware of the same type of item from only one Manufacturer.

2.02 HARDWARE

- A. General:
 - 1. Provide items as listed in schedule complete to function as intended.
 - 2. Manufacture hardware supplied for metal doors or jambs to template and secure with machine screws.
 - 3. Where cylindrical locks are used in hollow metal doors, furnish lock reinforcing in the door at the time of manufacture.
 - 4. Furnish finish hardware with all necessary screws, bolts, or other fastenings of suitable; size and type to anchor the hardware in position for heavy use and long life, and of compatible material and finish.
 - 5. Furnish fastenings with anchors according to the material to which it is applied, and as recommended by the Manufacturer.
 - 6. Furnish hardware fastened to concrete with machine screws and tampins.
 - 7. Fasten closers on wood or mineral core doors with fasteners recommended by the closer manufacturer for the apparent intended use of the device, unless the installation is in an opening requiring UL-rated hardware in which case sex nuts and bolts (approved by UL) are required by UL.

8. For surface mounted closer, pivot hinges, concealed closers or holders or other hardware mortised into the top or bottom edges, edges shall be a minimum of 4-1/2 inches, thoroughly kiln-dried hardwood.
- B. Finishes: US 26D (626), satin chrome, and US 32D (630), satin stainless steel, unless scheduled otherwise.
- C. Butt Hinges:
 1. Determine correct clearance from the Drawings.
 2. Provide non-removable pins on exterior outswinging doors and reverse bevel interior locked doors.
 3. Doors with closers shall have ball bearing butts.
 4. Flat button, top and bottom tips required.
 5. Butt Hinge Length: As recommended by Manufacturer.
 6. Number of Butt Hinges Required: As recommended by Manufacturer.
- D. Door Locks and Latchsets: Types, series, designs, functions and finishes as listed in hardware sets.
 1. Design shall permit removal of cylinder without removing lock from door.
 2. Provide locks and latchsets with 2-3/4 inch backset unless otherwise noted.
 3. Provide strikes with extended lip where required to protect trim from being marred by latch bolt.
 4. Provide wrought boxes with strikes.
- E. Door Closers:
 1. Surface mounted without covers, finish sprayed to match other hardware.
 2. Bodies to be close grained malleable iron, with 3 separate control valves (including backcheck) ANSI Grade 1 or aluminum, ANSI Grade 1.
 3. Closer to be equipped with size adjustment (1 through 6) in the field by the installer.
 4. Equip closers mounted on wood or mineral core doors with conventional fasteners unless the manufacturer of the closer recommends sex nuts and bolt because of the apparent frequency use of the closer. In the event the door is indicated to be UL-rated, the sex nuts and bolts shall be UL approved.
 5. Closers to be installed on interior of door.
 6. Provide EDA arms for parallel applications.
 7. Provide type as listed in sets.
- F. Exit Devices:
 1. U.L. approved for Casualty.
 2. Devices to match in design.
 3. Types, functions and finishes as listed in hardware sets.
 4. Fire doors to be equipped with UL rated exit devices meeting the fire label requirement.
- G. Push Plates: Type and size as listed.
- H. Pull Plates: Type and size as listed.
- I. Kickplates and Armorplates: Size as listed. Provide .050 inch thick stainless steel with No. 4 finish, edges ground smooth.
- J. Overhead Holders or Stops: As listed in hardware sets.
- K. Stops and Bumpers: Wall type WC9XT shall be used when possible. Locate wall bumpers to prevent lockset lever or closer from touching wall. Walls to receive proper backing for wall bumpers as specified in Section 06 10 00 - Rough Carpentry.

- L. Silencers: At metal frames; 3 at each jamb of single doors, 2 at each jamb of double doors. Not required on doors having weatherstrip or seals.
- M. Flushbolts: As listed in hardware sets.
- N. Weatherproofing, Smoke Seals and Door Bottoms:
 - 1. Continuous at head and jamb of exterior doors; continuous smoke seals at head and jamb of corridor doors.
- O. Thresholds: Sized for opening; to meet handicapped conditions. Provide as detailed on Drawings, or as listed in hardware sets.
- P. Knox Box: Model 3200-R, 4"W x 5"H x 3-1/4" deep with 7"W x 7"H flange, black polyester powder coat finish.

2.03 KEYING

- A. Door Locks: As directed by the owner keyed to the existing Best Great Grand Master key system. Verify keyway by owner.
- B. Supply (1) one key for each lock.
- C. Supply additional keys in following quantities:
 - 1. (1) master key.
 - 2. (1) grand master key.
 - 3. (1) great grand master key.
 - 4. (5) construction keys.
 - 5. (1) control key
- D. Permanent keys will not be made available to the General Contractor or any Subcontractor or Supplier under any circumstances .

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine conditions under which finish hardware will be installed. Report deficiencies to the Architect.

3.02 INSTALLATION

- A. Install hardware in accordance with Manufacturer's recommendations, using proper templates.
- B. Maintain ANSI standard mounting heights for doors, from finished floor to center line of hardware item.
- C. Knox Box: Recessed into wall construction and rigidly anchored in place at locations indicated on Drawings in accordance with requirements for Fire Department access.

3.03 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

3.04 FIELD QUALITY CONTROL

- A. Manufacturer's representative(s) shall inspect hardware at fire rated doors (including doors and frames as a unit) and verify compliance with UL 10C (positive pressure testing) as required by 2006 IBC Section 715. Hardware at fire rated doors which does not comply with UL 10C (positive pressure testing) as required by 2006 IBC Section 715 shall be removed and replaced at no additional cost to Owner.

3.05 SCHEDULES

HW-01 Exterior Entry: Opening 101A

3 ea.	Hinges	5BB1HW 4-1/2" x 4-1/2"	652	IVE
1 ea.	Entry Lock	Onity Replacement TBD	626	OWNER
1 ea.	Closer	4040XP H	689	LCN
1 ea.	Floor Stop	241F	626	HAG
1 set	Weatherstrip	303AS 1 x 36" + 2 x 84"		PEM
1 ea.	Threshold	171A 36"		PEM
1 ea.	Sweep	315CN 36"		PEM

Note: Onity Replacement Lock Provided By Owner

HW-02 Exterior Entry: Opening 109A

3 ea.	Hinges	5BB1HW 4-1/2" x 4-1/2" NRP	652	IVE
1 ea.	Entry Lock	Onity Replacement TBD	626	OWNER
1 ea.	Closer	4040XP CUSH	689	LCN
1 set	Weatherstrip	303AS 1 x 36" + 2 x 84"		PEM
1 ea.	Threshold	171A 36"		PEM
1 ea.	Sweep	315CN 36"		PEM

Note: Onity Replacement Lock Provided By Owner

HW-02A Entry: Openings 101B, 125B

3 ea.	Hinges	5BB1HW 4-1/2" x 4-1/2"	652	IVE
1 ea.	Entry Lock	Onity Replacement TBD	626	OWNER
1 ea.	Closer	4040XP SCUSH	689	LCN
3 ea.	Silencers	SR64	Gray	IVE

Note: Onity Replacement Lock Provided By Owner

HW-03 Interior: Opening 101C

3 ea.	Hinges	5BB1 4-1/2" x 4-1/2"	652	IVE
1 ea.	Entry Lockset	195 RAB/US26D- E4 SFIC G3	US26D	MAR
1 ea.	Perm Core	1C7-2 -(VERIFY KEYWAY)	626	BEST
1 ea.	Closer	4040XP Rw/PA	689	LCN
1 ea.	Floor Stop	241F	626	HAG
3 ea.	Silencers	SR64	Gray	IVE

HW-04 Office: Openings 102A, 103A, 104A, 110A, 111A, 112A, 118A, 201A, 202A, 203A, 204A

3 ea.	Hinges	5BB1 4-1/2" x 4-1/2"	652	IVE
1 ea.	Entry Lockset	195 RAB/US26D- E4 SFIC G3	US26D	MAR
1 ea.	Perm Core	1C7-2 –(VERIFY KEYWAY)	626	BES
1 ea.	Wall Stop	236W	626	HAG
3 ea.	Silencers	SR64	Gray	IVE

HW-05 Interior Entry: Opening 106B

3 ea.	Hinges	5BB1 4-1/2" x 4-1/2"	652	IVE
1 ea.	Entry Lock	Onity Replacement TBD	626	OWNER
1 ea.	Closer	4040XP Rw/PA	689	LCN
1 ea.	Wall Stop	236W	626	HAG
3 ea.	Silencers	SR64	Gray	IVE

Note: Onity Replacement Lock Provided By Owner

HW-06 Interior Storeroom: Openings 107B, 128A

3 ea.	Hinges	5BB1 4-1/2" x 4-1/2"	652	IVE
1 ea.	Storeroom Lockset	195 RF/US26D- E4 SFIC G3	US26D	MAR
1 ea.	Perm Core	1C7-2 –(VERIFY KEYWAY)	626	BES
1 ea.	Overhead Stop	454S	652	GJ
3 ea.	Silencers	SR64	Gray	IVE

HW-06A Interior Storeroom: Openings 132A, 207A, 209A

3 ea.	Hinges	5BB1 4-1/2" x 4-1/2"	652	IVE
1 ea.	Storeroom Lockset	195 RF/US26D- E4 SFIC G3	US26D	MAR
1 ea.	Perm Core	1C7-2 –(VERIFY KEYWAY)	626	BES
1 ea.	Wall Stop	236W	626	HAG
3 ea.	Silencers	SR64	Gray	IVE

HW-07 Interior Entry: Openings 117A, 119A

3 ea.	Hinges	5BB1 4-1/2" x 4-1/2"	652	IVE
1 ea.	Entry Lock	Onity Replacement TBD	626	OWNER
1 ea.	Closer	4040XP Rw/PA	689	LCN
1 ea.	Wall Stop	236W	626	HAG
3 ea.	Silencers	SR64	Gray	IVE

Note: Onity Replacement Lock Provided By Owner

HW-07A Interior Entry: Openings 127A

3 ea.	Hinges	5BB1 4-1/2" x 4-1/2"	652	IVE
1 ea.	Entry Lock	Onity Replacement TBD	626	OWNER
1 ea.	Closer	4040XP Rw/PA	689	LCN
1 ea.	Floor Stop	241F	626	HAG
3 ea.	Silencers	SR64	Gray	IVE

Note: Onity Replacement Lock Provided By Owner

HW-08 Interior Storeroom Pair: Openings 105A

6 ea.	Hinges	5BB1 4-1/2" x 4-1/2"	652	IVE
1 ea.	Storeroom Lockset	195 RF/US26D- E4 SFIC G3	US26D	MAR
1 ea.	Perm Core	1C7-2 –(VERIFY KEYWAY)	626	BES
1 set	Manual Flush Bolts	458 12"	626	IVE
2 ea.	Overhead Stops	454S	652	IVE
2 ea.	Silencers	SR64	Gray	IVE

HW-09 Exterior Exit Pair: Opening 107A

6 ea.	Hinges	5BB1HW 4-1/2" x 4-1/2" NRP	652	IVE
1 ea.	Rim Exit Device	99EO 36" x Onity Trim TBD	626	VON
1 ea.	Rim Exit Device	99DT x 990DT	626	VON
1 ea.	Keyed Rem Mullion	KR4954 299 84"	SP28	VON
1 ea.	Mortise Cylinder	1E74-C4	626	BES
1 ea.	Perm Core	1C7-2 –(VERIFY KEYWAY)626	BES	
2 ea.	Closers	4040XP CUSH	689	LCN
2 ea.	Sweeps	315CN 36"		PEM
1 set	Weatherstrip	303AS 1 x 72" + 2 x 84"		PEM
1 ea.	Mullion Seal	5110BL 84"	BLK	PEM
1 ea.	Threshold	171A 72"		PEM

Note: Onity Exit Device Trim By Owner.

HW-10 Aluminum Pair: Opening 108A

1 ea.	CVR Exit Device	EL9947ANL-OP x 110NL-MD 36"	626	VON
1 ea.	CVR Exit Device	9947AEO 36"	626	VON
1 ea.	Rim Cylinder	1E72	626	BES
1 ea.	Perm Core	1C7-2 –(VERIFY KEYWAY)	626	BES
1 ea.	Low Energy Operator	4642 STD	AL	LCN
1 ea.	Closer	4040XP HCUSH	689	LCN
2 ea.	Pulls	8190-18"	US32D	IVE
1 ea.	Floor Stop	FS18S	BLK	IVE
1 ea.	Push Button	CTP-H		MSS
1 ea.	Power Supply	PS914-2RS		VON

Note: Balance Of Hardware By Aluminum Door Supplier. Card Reader, 110 Power, Low Voltage Wiring And Connections, And All Other Access Control Components Provided By Others.

HW-11 Interior Exit Pair: Openings 125A, 125C

6 ea.	Hinges	5BB1HW 4-1/2" x 4-1/2"	652	IVE
2 ea.	Rim Exit Devices	99L-BE x 996L-BE-R&V 36"	626	VON
1 ea.	Keyed Rem Mullion	KR4954 299 84"	SP28	VON
1 ea.	Mortise Cylinder	1E74-C4	626	BES
1 ea.	Perm Core	1C7-2 –(VERIFY KEYWAY)	626	BES
2 ea.	Closers	4040XP SCUSH	689	LCN
2 ea.	Silencers	SR64	Gray	IVE

HW-12 Exterior Exit Pair: Openings 126A, 126B

6 ea.	Hinges	5BB1HW 4-1/2" x 4-1/2" NRP	652	IVE
1 ea.	Rim Exit Device	EL99NL-OP x 110NL-MD 36"	626	VON
1 ea.	Rim Exit Device	99EO 36"	626	VON
1 ea.	Keyed Rem Mullion	KR4954 299 84"	SP28	VON
1 ea.	Rim Cylinder	1E72	626	BES
1 ea.	Mortise Cylinder	1E74-C4	626	BES
2 ea.	Perm Core	1C7-2 –(VERIFY KEYWAY)	626	BES
1 ea.	Low Energy Operator	4642 STD	AL	LCN
1 ea.	Closer	4040XP CUSH	689	LCN
2 ea.	Sweeps	315CN 36"		PEM
1 set	Weatherstrip	303AS 1 x 72" + 2 x 84"		PEM
1 ea.	Mullion Seal	5110BL 84"	BLK	PEM
1 ea.	Threshold	171A 72"		PEM
1 ea.	Push Button	CTP-H		MSS
1 ea.	Power Supply	PS914-2RS		VON

Note: Card Reader, 110 Power, Low Voltage Wiring And Connections, And All Other Access Control Components Provided By Others.

HW-13 Interior Pair: Opening 107E

6 ea.	Hinges	5BB1HW 4-1/2" x 4-1/2"	652	IVE
2 ea.	Push/Pulls	9190-33"-18"-NS	US32D	IVE
2 ea.	Closers	4040XP HCUSH	689	LCN
2 ea.	Silencers	SR64	Gray	IVE

HW-14 Interior Rated Storeroom: Opening 124A

3 ea.	Hinges	5BB1 4-1/2" x 4-1/2"	652	IVE
1 ea.	Storeroom Lockset	195 RF/US26D- E4 SFIC G3	US26D	MAR
1 ea.	Perm Core	1C7-2 –(VERIFY KEYWAY)	626	BES
1 ea.	Closer	4040XP Rw/PA	689	LCN
1 ea.	Smoke Seal	S88D 17'	BRN	PEM
1 ea.	Wall Stop	236W	626	HAG
1 ea.	Threshold	271A 36"		PEM

HW-15 Rated Exit: Opening 107C

3 ea.	Hinges	5BB1HW 4-1/2" x 4-1/2" NRP	652	IVE
1 ea.	Rim Exit Device	99NL-F x 990NL-R&V 36"	626	VON
1 ea.	Rim Cylinder	1E72	626	BES
1 ea.	Perm Core	1C7-2 –(VERIFY KEYWAY)	626	BES
1 ea.	Closer	4040XP SCUSH	689	LCN
1 ea.	Smoke Seal	S88D 17'	BRN	PEM
1 ea.	Threshold	271A 36"		PEM

HW-16 Rated Exit Pair: Opening 107D

6 ea.	Hinges	5BB1HW 4-1/2" x 4-1/2" NRP	652	IVE
2 ea.	Rim Exit Devices	99L-F x 996L-R&V 36"	626	VON
1 ea.	Keyed Rem Mullion	KR4954 299 84"	SP28	VON
2 ea.	Rim Cylinder	1E72	626	BES
1 ea.	Mortise Cylinder	1E74-C4	626	BES
3 ea.	Perm Core	1C7-2 –(VERIFY KEYWAY)	626	BES
2 ea.	Closers	4040XP SCUSH	689	LCN
1 ea.	Mullion Seal	5110BL 84"	BLK	PEM
1 ea.	Smoke Seal	S88D 20'	BRN	PEM
1 ea.	Threshold	271A 72"		PEM

HW-17 Rated Entry: Opening 125D

3 ea.	Hinges	5BB1HW 4-1/2" x 4-1/2"	652	IVE
1 ea.	Entry Lock	Onity Replacement TBD	626	BES
1 ea.	Closer	4040XP SCUSH	689	LCN
1 ea.	Smoke Seal	S88D 17'	BRN	PEM
1 ea.	Threshold	271A 36"		PEM

HW-18 Rated Exit: Opening 127B

3 ea.	Hinges	5BB1HW 4-1/2" x 4-1/2" NRP	652	IVE
1 ea.	Rim Exit Devices	99L-F x 996L-R&V ALK 36"	626	VON
1 ea.	Rim Cylinder	1E72	626	BES
1 ea.	Perm Core	1C7-2 –(VERIFY KEYWAY)	626	BES
1 ea.	Closer	4040XP SCUSH	689	LCN
1 ea.	Smoke Seal	S88D 17'	BRN	PEM
1 ea.	Threshold	271A 36"		PEM

HW-19 Restroom Vestibule: Openings 129A, 133B, 135B, 140A, 140B, 144A, 144B

3 ea.	Hinges	5BB1HW 4-1/2" x 4-1/2"	652	IVE
1 ea.	Push	8200 4" x 16"	630	IVE
1 ea.	Pull	8302-6 4" x 16"	630	IVE
1 ea.	Closer	4040XP Rw/PA	689	LCN
1 ea.	Kick Plate	8400 12" x 34"	630	IVE
1 ea.	Floor Stop	241F	626	HAG

HW-20 Rated Restroom: Openings 130A, 133A, 135A, 141A, 143A

3 ea.	Hinges	5BB1HW 4-1/2" x 4-1/2"	652	IVE
1 ea.	Classroom Lockset	195 RS/US26D- E4 SFIC G3	626	MAR
1 ea.	Perm Core	1C7-2 –(VERIFY KEYWAY)	626	BES
1 ea.	Closer	4040XP SCUSH	689	LCN
1 ea.	Kick Plate	8400 12" x 34"	630	IVE
1 ea.	Smoke Seal	S88D 17'	BRN	PEM
1 ea.	Threshold	271A 36"		PEM

HW-21 Exterior Restroom: Openings 134A, 136A, 142A, 145A

3 ea.	Hinges	5BB1HW 4-1/2" x 4-1/2" NRP	652	IVE
1 ea.	Deadbolt	83T 7S STK	626	BES
1 ea.	Perm Core	1C7-2 –(VERIFY KEYWAY)	626	BES
1 ea.	Push	8200 4" x 16"	630	IVE
1 ea.	Pull	8302-6 4" x 16"	630	IVE
1 ea.	Closer	4040XP HCUSH	689	LCN
1 ea.	Kick Plate	8400 12" x 34"	630	IVE
1 set	Weatherstrip	303AS 1 x 36" + 2 x 84"		PEM
1 ea.	Threshold	171A 36"		PEM
1 ea.	Sweep	315CN 36"		PEM

HW-22 Exterior Storeroom: Opening 139A

3 ea.	Hinges	5BB1 4-1/2" x 4-1/2" NRP	652	IVE
1 ea.	Storeroom Lockset	195 RF/US26D- E4 SFIC G3	US26D	MAR
1 ea.	Perm Core	1C7-2 –(VERIFY KEYWAY)	626	BES
1 ea.	Closer	4040XP Hw/PA	689	LCN
1 set	Weatherstrip	303AS 1 x 36" + 2 x 84"		PEM
1 ea.	Threshold	171A 36"		PEM
1 ea.	Sweep	315CN 36"		PEM

HW-23 Exterior Storeroom Pair: Opening 146A

6 ea.	Hinges	5BB1 4-1/2" x 4-1/2" NRP	652	IVE
1 ea.	Storeroom Lockset	195 RF/US26D- E4 SFIC G3	US26D	MAR
1 ea.	Perm Core	1C7-2 –(VERIFY KEYWAY)	626	BES
1 set	Manual Flush Bolts	458 12"	626	IVE
1 ea.	Closer	4040XP Hw/PA	689	LCN
1 ea.	Overhead Stop	454S	652	GJ
1 ea.	Astragal	357SP 84"	USP	PEM
1 set	Weatherstrip	303AS 1 x 72" + 2 x 84"		PEM
1 ea.	Threshold	171A 72"		PEM
2 ea.	Sweep	315CN 36"		PEM

HW-24 Exterior Exit: Opening 147A

3 ea.	Hinges	5BB1HW 4-1/2" x 4-1/2" NRP	652	IVE
1 ea.	Rim Exit Device	99NL x 990NL-R&V	US26D	VON
1 ea.	Rim Cylinder	1E72	626	BES
1 ea.	Perm Core	1C7-2 –(VERIFY KEYWAY)	626	BES
1 ea.	Closer	4040XP Rw/PA	689	LCN
1 set	Weatherstrip	303AS 1 x 36" + 2 x 84"		PEM
1 ea.	Threshold	171A 36"		PEM
1 ea.	Sweep	315CN 36"		PEM

HW-25 Rated Storeroom: Opening 137A

3 ea.	Hinges	5BB1 4-1/2" x 4-1/2"	652	IVE
1 ea.	Storeroom Lockset	195 RF/US26D- E4 SFIC G3	US26D	MAR
1 ea.	Perm Core	1C7-2 –(VERIFY KEYWAY)	626	BES
1 ea.	Closer	4040XP CUSH	689	LCN
1 ea.	Kick Plate	8400 12" x 34"	630	IVE
1 ea.	Smoke Seal	S88D 17'	BRN	PEM
1 ea.	Threshold	271A 36"		PEM

HW-26 Laundry:

3 ea.	Hinges	5BB1 4-1/2" x 4-1/2"	652	IVE
1 ea.	Entry Lockset	195 RAB/US26D- E4 SFIC G3	US26D	MAR
1 ea.	Perm Core	1C7-2 –(VERIFY KEYWAY)	626	BES
1 ea.	Closer	4040XP H	689	LCN
1 ea.	Wall Stop	236W	626	HAG
1 ea.	Kick Plate	8400 12" x 34"	630	IVE
3 ea.	Silencers	SR64	Gray	IVE

HW-27 Storeroom Pair: Opening 131A

6 ea.	Hinges	5BB1HW 4-1/2" x 4-1/2"	652	IVE
1 ea.	Storeroom Lockset	195 RF/US26D- E4 SFIC G3	US26D	MAR
1 ea.	Perm Core	1C7-2 –(VERIFY KEYWAY)	626	BES
1 set	Manual Flush Bolts	458 12"	626	IVE
1 ea.	Coordinator	COR52 FL20 2-MB2	US28	IVE
1 ea.	Dust Proof Strike	DP2	626	IVE
2 ea.	Closer	4040XP Rw/PA	689	LCN
1 ea.	Astragal	351SP 84"	SP28	PEM
2 ea.	Armor Plates	8400 34" x 36"	630	IVE
1 ea.	Smoke Seal	S88D 20'	BRN	PEM

HW-28 Locker Room: Openings 205A, 206A, 208A

3 ea.	Hinges	5BB1 4-1/2" x 4-1/2"	652	IVE
1 ea.	Entry Lockset	195 RAB/US26D- E4 SFIC G3	US26D	MAR
1 ea.	Perm Core	1C7-2 –(VERIFY KEYWAY)	626	BES
1 ea.	Closer	4040XP Rw/PA	689	LCN
1 ea.	Wall Stop	236W	626	HAG
3 ea.	Silencers	SR64	Gray	IVE

END OF SECTION

SECTION 08 80 00

GLAZING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes the following:
 - 1. Glass and glazing for interior and exterior applications.
- B. Related Sections:
 - 1. Section 08 83 00 – Mirrors, for custom sized plate glass mirrors.

1.02 PERFORMANCE REQUIREMENTS

- A. Glass and glazing materials shall provide continuity of building enclosure vapor and air barrier.
 - 1. To utilize the inner pane of multiple pane sealed units for the continuity of air and vapor seal.
 - 2. Maintain continuous air and vapor barrier throughout glazed assembly from glass pane to heel bead of glazing sealant.
- B. Glass thickness indicated is minimum and shown for detailing only. Size glass to withstand dead loads and positive and negative live loads acting normal to plane of glass as calculated in accordance with IBC Chapter 24, as measured in accordance with ANSI/ASTM E330.
- C. Limit glass deflection to 1/175 or flexure limit of glass, with full recovery of glazing materials, whichever is less.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's Product Data for glass units, including the following:
 - 1. Structural, physical and environmental characteristics.
 - 2. Size limitations.
 - 3. Special handling or installation requirements
 - 4. Special application requirements for glazing materials.
 - 5. Available colors of glass and glazing materials with color selections.
- B. Samples: Submit samples as follows:
 - 1. Two samples 8 x 8 inch in size of each type of glass product required, illustrating coloration, edge treatment and design.
 - 2. Four inch long bead of glazing sealant, color as selected.
- C. Manufacturer's Certificate: Submit Manufacturer's certification that sealed insulated glass meets or exceeds specified requirements.

1.04 QUALITY ASSURANCE

- A. Regulatory Requirements: Conform to 2006 IBC Chapter 24, to local requirements and to State law.

- B. Standards:
 - 1. ANSI/ASTM E330 - Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
 - 2. ANSI Z97.1 - Safety Performance Specifications and Methods of Test for Safety Glazing Used in Buildings.
- C. Perform Work in accordance with GANA Glazing Manual, GANA Sealant Manual, and Laminators Safety Glass Association - Standards Manual for Glazing Installation Methods.
- D. Source Limitations: Obtain each type of glass from a single manufacturer using the same type of glass lights and inner layers for each type of glass type or unit specified. Obtain glazing assemblies from one source for each product and/or installation specified and/or required.
- E. Installer Qualifications: An experienced installer who has successfully completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance for a minimum of 10 years; and who employs glass installers for this project who are certified under the National Glass Association Glazier Certification Program as Level 2 (Senior Glaziers) or Level 3 (Master Glaziers).

1.05 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.
- B. Storage: Adequately protect against damage while stored at the site.
- C. Handling: Comply with Manufacturer's instructions.

1.06 WARRANTY

- A. Provide 5 year Manufacturer's warranty for sealed glass units from seal failure, interpane dusting or misting, and replacement of same.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Glass Materials: Furnish products of one of the following Manufacturers, except as otherwise approved by the Architect, subject to compliance with Specification requirements:
 - 1. Guardian Industries. www.guardian.com .
 - 2. Oldcastle Glass Group. www.oldcastleglass.com .
 - 3. Pilkington LOF. www.pilkington.com .
 - 4. PPG Industries. www.ppg.com .
 - 5. Viracon. www.viracon.com .
 - 6. ACH Float Glass Operations <http://www.versaluxglass.com/>.

2.02 GLASS MATERIALS

- A. Float Glass: ASTM C1036, Type 1 transparent flat, Class 1 clear, Quality q3 glazing select; 1/4 inch thick minimum.

- B. Safety Glass: ASTM C1048, Kind FT fully tempered with horizontal tempering Condition A uncoated, Type 1 transparent flat, Class 1 clear, Quality q3 glazing select; conforming to ANSI Z97.1; 1/4 inch minimum.
- C. Fire Rated Glazing:
 - 1. 60 Minute Fire Rating: SuperLite I-XL 60 as manufactured by Safety and Fire Technology, Inc., San Francisco, CA (800) 822-2088 www.safti.com, or Pyrostop 60 as manufactured by the Pilkington Group and distributed by Technical Glass products, Kirkland, WA (800) 426-0279 www.fireglass.com.

2.03 SEALED INSULATING GLASS MATERIALS

- A. Insulating Glass: Units shall comply with ASTM E2190 Standard Specification for Insulating Glass Unit Performance and Evaluation.
 - 1. Units shall be certified for compliance by the IGCC in accordance with the above ASTM test method.
 - 2. The unit overall thickness tolerance shall be minus 1/16 inch / plus 1/32 inch. Unit constructed with patterned or laminated glass shall be plus or minus 1/16 inch.
 - 3. Shall comply with ASTM E546 Standard Test Method for Frost Point of Sealed Insulating Glass Units.
 - 4. Shall comply with ASTM E576 Standard Test Method for Frost Point of Sealed Insulating Glass Units in the Vertical Position
 - 5. Sealed Insulating Glass Units to be double sealed with a primary seal of polyisobutylene and a secondary seal of silicone.
 - a. The minimum thickness of the secondary seal shall be 1/16 inch.
 - b. The target width of the primary seal shall be 5/32 inch.
 - c. There shall be no voids or skips in the primary seal.
 - d. Gaps or skips between primary and secondary sealant are permitted to a maximum width of 1/16 inch by maximum length of 2 inches with gaps separated by at least 18 inches. Continuous contact between the primary seal and the secondary seal is desired.
 - e. Both primary and secondary sealant adhesion shall exhibit continuous, tenacious adhesion to both glass and spacer contact areas.
 - 6. To provide a hermetically sealed and dehydrated space, lites shall be separated by an aluminum spacer with three bent corners and one keyed-soldered corner or four bent corners and one straight butyl injected zinc plated steel straight key joint.
 - a. Finish: Clear anodized.
 - 7. Individual panes of insulated glass units shall be Kind HS (heat strengthened) or Kind FT (fully tempered) where required to resist thermal stress in insulating glass units as determined by the manufacturer, or Kind FT (fully tempered) where indicated or required by Code by location.
- B. Insulated Low-E Glass Units: Guardian Sunguard SuperNeutral 54 (#2) Low-E Insulating Glass units complying with ASTM E774 and E773 and as follows or as otherwise approved by the Architect from one of the specified acceptable manufacturers:
 - 1. Pane: Double pane
 - 2. Edge Seal: Silicone sealant
 - 3. Outer Pane: 1/4 thick minimum clear glass with Guardian SuperNeutral 54 (#2).
 - 4. Inner Pane: 1/4 inch thick minimum clear glass.
 - 5. Interpane Space: Purged dry air
 - 6. Visible Light Transmittance: 54 percent
 - 7. Exterior (Vis-Out) Reflectance: 13 percent
 - 8. Winter U-Value: 0.29
 - 9. Summer U-Value: 0.27
 - 10. Shading Coefficient: 0.32

11. Solar Heat Gain Coefficient: 0.28
12. Light to Solar Gain Ratio: 1.91
13. Total Unit Thickness: 1 inch.

- C. Insulated Low-E Glass Units: Clear Low-E Insulating Glass units complying with ASTM E774 and E773 and as follows or as otherwise approved by the Architect from one of the specified acceptable manufacturers:
1. Pane: Double pane
 2. Edge Seal: Silicone sealant
 3. Outer Pane: 1/4 thick minimum clear glass with Low-E Coating (#2).
 4. Inner Pane: 1/4 inch thick minimum clear glass.
 5. Interpane Space: Purged dry air
 6. Total Unit Thickness: 1 inch.

2.04 GLAZING ACCESSORIES

- A. Setting Blocks: Neoprene or other resilient blocks of 70 to 90 Shore A durometer hardness tested for compatibility with glazing sealant, minimum length 4 inches, sized per GANA guidelines.
- B. Spacers: Neoprene or EPDM blocks of 65+5 Shore A durometer hardness, designed to maintain positioning of glass and prevent shifting of glass in the glazing pocket and tested for compatibility with specified glazing sealant.
- C. Glazing Gaskets: Neoprene or EPDM and silicone compatible, non-cellular dense, 75 +/- 5 Shore A durometer, complying with ASTM C864, option 1 or 2.
1. Bed all gasket corners, molded or not in elastomeric silicone sealant.
- D. Interior Glazing Compound: Polymerized Butyl Rubber and Inert Fillers (pigments), solvent based with minimum 75% solids, non-sag consistency, tack-free time of 24 hours or less, paintable non-staining.
- E. Exterior Glazing Compound: Conforming to ASTM C920, Type S, Grade NS, Use G. Compound shall be paintable, or colored to match frame.
- F. Glazing Tape: Preshimmed 10 percent solids, non-shrinking, butyl rubber tape compatible with sealants. If exposed, tape shall be paintable, or colored to match frame.

2.05 MARKINGS

- A. Tempered glass shall have each light permanently etched with Manufacturer's name and his compliance with ANSI Z-97.1.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Examine framing or glazing channel surfaces, backing, removable stop design, and conditions under which glazing is to be performed.

- C. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

- A. Comply with combined recommendations of Glass Manufacturer, aluminum frame manufacturer and manufacturer of sealants and other materials used in glazing, except where more stringent requirements are shown or specified.
- B. Clean the glazing, channel, or other framing members to receive glass, immediately before glazing. Remove coatings which are not firmly bonded to the substrate.
- C. Do not attempt to cut, seam, nip, or abrade glass which is tempered or heat strengthened.
- D. Comply with "Glazing Manual" by GANA, except as shown and specified otherwise by Manufacturers of glass and glazing materials.
- E. Inspect each piece of glass immediately before installation, and discard those which have observable edge damage or face imperfections.
- F. Install setting blocks of proper size at quarter points or eighth points but at no time closer than 6 inches from the end of the horizontal frame in a bead of clear silicone sealant.
- G. Provide spacers inside and out, and of proper size and spacing, for glass sizes larger than 50 united inches. Provide 1/8 inch minimum bite of spacers on glass and use thickness equal to sealant width.
- H. Unify appearance of each series of lights by setting each piece to match others as nearly as possible. Inspect each piece and set with pattern, draw and bow oriented in the same direction as other pieces.
- I. Gasket Glazing:
 - 1. Fabricate gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance during installation.
 - 2. Miter cut and bond ends together at corners where gaskets are used for channel glazing, so that gaskets will not pull away from corners and result in voids or leaks in the glazing system.
 - 3. Insert gasket between glass and frame or fixed stop, securely in place.

3.03 EXTERIOR COMBINATION METHOD (TAPE AND SEALANT)

- A. Clean contact surfaces with solvent.
- B. Cut glazing tape to proper length and set against permanent stops, 3/16 inch below sightline. Weld corners together by butting tape and dabbing with sealant.
- C. Apply bed of sealant along exterior void ensuring full contact with glass.
- D. Place setting blocks at 1/4 points or eighth points, but at a minimum 6 inches from the near edge of block to edge of glass.
- E. Rest glass on setting blocks and push against tape (and heel bead of sealant) with sufficient pressure to ensure full contact and adhesion at perimeter.

- F. Install removable stops, spacer strips inserted between glass, and applied stops at 2-foot intervals, 1/4 inch below sightline. Place glazing tape on glass with tape flush with sightline.
- G. Fill gap between glass and applied stop with sealant to depth equal to bite of frame on glass but not more than 3/8 inch below sightline.
- H. Apply cap bead of sealant along exterior void, to uniform and level line, flush with sightline. Tool or wipe cap bead surface with solvent for smooth appearance.

3.04 INTERIOR COMBINATION METHOD (TAPE AND SEALANT)

- A. Cut glazing tape to proper length and install against permanent stop, projecting 1/16 inch above sightline.
- B. Place setting blocks at 1/4 point or eighth points, but at a minimum of 6 inches from the near edge of block to edge of glass.
- C. Rest glass on setting blocks and push against tape with sufficient pressure to ensure full contact and adhesion at perimeter.
- D. Install removable stops; spacer strips inserted between glass and applied stops at 2 foot intervals, 1/4 inch below sightline.
- E. Fill gap between glass and applied stop with sealant to depth equal to bite of frame on glass to uniform and level line.
- F. Neatly trim off excess tape to sightline.

3.05 ADJUSTING

- A. Remove and replace glass which is broken, chipped, cracked, abraded or damaged in any other way during the construction period, including natural causes, accidents and vandalism.

3.06 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.
- B. Remove labels after Work is completed.

3.07 PROTECTION

- A. Protect glass from breakage immediately upon installation, by attachment of crossed streamers to framing held away from glass.
- B. Do not apply markers of any type to surfaces of glass.

END OF SECTION

SECTION 08 83 00

MIRRORS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Frameless, custom size wall mounted mirrors as shown on Drawings and as specified.

1.02 SUBMITTALS

- A. Product Data: Submit physical and environmental characteristics, size limitations, and special handling or installation requirements for glass mirror materials.
- B. Samples: Submit samples of mirror support hardware.

1.03 QUALITY ASSURANCE

- A. Standards: ANSI Z97.1 - Safety Performance Specifications and Methods of Test for Safety Glazing Used in Buildings.
- B. Perform Work in accordance with FGMA Glazing Manual.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.
- B. Storage: Adequately protect against damage while stored at the site.
- C. Handling: Comply with Manufacturer's instructions.

PART 2 PRODUCTS

2.01 GLASS MATERIALS

- A. Mirror Glass: ASTM C1036, Type 1 transparent flat, Class 1 clear, Quality q1 mirror select; 1/4 inch thick, with successive layers of chemically deposited silver, electrically or chemically deposited copper, and manufacturer's standard organic protective coating applied to second glass surface. Provide fully tempered units where indicated or required by Code by location.
 - 1. Size(s): As indicated on Drawings.
 - 2. Edge Treatment: Square ground edges, painted flat black, unless otherwise indicated on Drawings.
 - 3. Factory seal edges of silvered mirrored glass immediately after edge treatment to prevent chemical or atmospheric penetration of glass coating.
 - 4. Laminated Safety Glass Mirrors: Provide laminated mirrored glass fabricated to produce units complying with ASTM C1172, Kind LM, where required by Code.

2.02 ACCESSORIES

- A. Setting Blocks and Gaskets: Neoprene or other resilient blocks of 70 to 90 Shore A durometer hardness tested for compatibility with glazing sealant, minimum length 4 inches.
- B. Mirror Mastic: Polymer type mirror mastic resistant to water, shock, cracking, vibration and thermal expansion, compatible with mirror backing paint and approved by mirror manufacturer.
- C. Mirror Setting Hardware:
 - 1. Bottom Support Channel: Provide extruded aluminum J-channel, length to match width of mirror; channel size to accept thickness of mirror with maximum 3/8 inch channel depth (front channel leg).
 - 2. Finish: Polished stainless steel or clear anodized, unless otherwise indicated on Drawings.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION GENERAL

- A. Comply with combined recommendations of Mirror Manufacturer and manufacturer of mirror mastic and other materials used in setting mirrors, except where more stringent requirements are shown or specified.
- B. Clean the wall surface, or other substrate to receive mirrors, immediately before installation. Remove coatings which are not firmly bonded to the substrate.
- C. Do not attempt to cut, seam, nip or abrade glass which is tempered or heat strengthened.
- D. Comply with "Glazing Manual" by FGMA, except as shown and specified otherwise by Manufacturers of mirrors and mirror mastic materials.
- E. Inspect each piece of mirror immediately before installation, and discard those which have observable edge damage or face imperfections.

3.03 ADHESIVE INSTALLATION OF MIRRORS

- A. Install mirrors by mirror mastic spot method as follows, unless otherwise indicated on Drawings:
 - 1. Attach mirror bottom support channel securely to wall, level and flush with wall surface, with mechanical fasteners, including anchors and inserts as required for supporting wall construction.
 - 2. Apply mirror mastic in spots at equal spacing to cover not more than 25 percent of back of mirror and as required to maintain air circulation behind back of mirror.

3. Set mirror in support channel on setting blocks or continuous gasket, and press against substrate to ensure bond of adhesive.
4. Leave open ventilation space, 1/8 inch or more in thickness between mirror and substrate, over 75 percent of mirror area (wherever there is no adhesive).

3.04 ADJUSTING

- A. Remove and replace mirrors which are broken, chipped, cracked, abraded or damaged in any other way during the construction period, including natural causes, accidents and vandalism.

3.05 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises.
- B. Remove labels after Work is completed.

END OF SECTION

SECTION 09 22 16

NON-STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Formed metal stud framing, furring, suspension systems and accessories as shown on Drawings and as specified.
- B. Related Sections:
 - 1. Section 05 40 00 – Cold-Formed Metal Framing, for exterior structural metal stud framing.

1.02 SUBMITTALS

- A. Product Data: Submit data describing standard framing member materials and finish, product criteria, load charts, limitations, and installation instructions.
- B. Certificates: Mill Certification shall be provided with shipment to verify chemical composition, yield strength, tensile strength, elongation and coating thickness. Include listing of applicable ASTM standards specified in this section and comparison of ASTM requirements to actual materials provided to jobsite.
- C. Manufacturer's letter: Manufacturer shall provide letter stating that the material supplied to the specific project meets or exceed the performance standards listed in these specifications.

1.03 QUALITY ASSURANCE

- A. Perform Work in accordance with the following:
 - 1. ASTM C 754 requirements.
 - 2. Applicable Code and Regulatory Requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products as manufactured by a manufacturing member of the Steel Stud Manufacturers Association (SSMA), subject to compliance with Specification requirements.

2.02 FRAMING MATERIALS

- A. Studs, Runners and Furring Channels:
 - 1. Steel complying with ASTM C645-07 requirements for metal; C-channel, roll-formed from hot dipped galvanized steel; complying with ASTM A1003 and ASTM A653 G40 or equivalent corrosion resistant coating.
 - 2. Material Thickness: Gauge or Mil thickness indicated on Drawings or in accordance with the latest edition of the SSMA Product Technical Information manual, Limiting Wall Height Tables, as required by height of wall.

3. Deflection Track: Provide deep leg, 2 inch minimum, head track, or one of the following proprietary systems:
 - a. Slotted Top Track (non-fire rated and fire-rated, as applicable): SLP-TRK® as manufactured by Sliptrack Systems (888) 475-7875 www.BradyInnovations.com, as distributed by Dietrich Metal Framing (614) 438-3210 www.dietrichindustries.com, gauge as per ICBO ER-5344, Table 2. Provide fire rated assemblies in accordance with manufacturer's literature, where applicable.
 - b. Non-Fire Rated Slotted Top Track - Single Track Slip System for Interior Partitions: As manufactured by Metal Lite, Inc., Anaheim, CA (800) 886-6824. Provide for partitions that are not required to be fire rated.
 - c. Fire Rated Shadowline Top Track - Single Track Slip System for Interior Partitions: Applicable configuration as required for fire rating as manufactured by Fire Trak Corporation, Kimball, MN (800) 394-9875. Provide for partitions that are required to be fire rated.
 4. Curved Stud and Track Components: Flex-C Trac 2-1/2 inch, 3-5/8 inch and 6 inch hand shapeable, pivotal track components manufactured of structural Grade 22, hot-dipped galvanized steel with a protective coating equal to G-60, as manufactured by Flex-Ability Concepts, Edmond, OK (405) 302-0611, or Custom curved stud and track components as manufactured by RadiusTrack Corporation, 6612 Lyndale Avenue South, Suite 2, Richfield, MN 55423 (888) 872-3487.
- B. Studs and Track: C-shaped, non-structural rolled steel, punched for utility access.
1. Stud Sizes: Provide studs of member depth and spacing indicated on Drawings with flange width and material thickness in accordance with the latest edition of the SSMA Product Technical Information manual, Limiting Wall Height Tables, as required by height of wall.
- C. Ceiling Runners: Cold or hot-rolled steel, meet ASTM C754.
- D. Hanger and Tie Wire: Meet ASTM C754.
- E. Compression Struts: C-shaped steel studs in minimum thickness as required to adequately resist the vertical component induced by the bracing wires in suspended ceiling applications.
- F. Furring Members: Of same gauge, material and finish as studs, thickness to suit purpose.
- G. Grid Type Ceiling Suspension System: Heavy duty, direct-hung, tee-grid gypsum board ceiling support system composed of galvanized finish commercial quality cold-rolled steel double web main and cross tees, clips, and preformed curved components.
1. Hanger Wire: Galvanized steel conforming to Federal Specification FF-QQ-W-461, Finish 5, Class 1 annealed, and not less than 12 gage).
 2. Suspension system shall support the ceiling system specified with a maximum deflection of 1/360 of the span.
 3. Acceptable Manufacturers:
 - a. Armstrong
 - b. USG Interiors, Inc.
- H. Channel Bridging and Bracing: Channel bridging and bracing members of same material and finish as studs. Spazzer® 9200 Bridging and Bracing Bar and Spazzer® Bar Guard, or U-channel assembly, thickness to suit purpose with EasyClip™ U-Series Clip Angle or equivalent.

- I. Clips, Brackets: Galvanized wire or sheet metal designed for attachment of framing, furring and bridging members.
 - 1. Deflection Clips: If acceptable to Building Official, VertiClip™ as manufactured by Signature Industries, LLC, Raleigh, NC (919) 844-0789, or FastClip™ or QuickClip™ as manufactured by Dietrich Metal Framing, Columbus, OH (614) 438-3210 may be provided for attachment of framing to roof and floor construction at head and slide conditions. Provide sizes as required for stud depth(s). Clips shall be manufactured of steel conforming to ASTM A 653 Prime Certified G90 galvanized material, 50 ksi yield strength and 65 ksi ultimate strength. Deflection clips to have positive attachment to structure and stud material while allowing for frictionless movement.
 - 2. Bridging Clips: If acceptable to Building Official, BridgeClip™ as manufactured by Signature Industries, LLC, Raleigh, NC (919) 844-0789, or EasyClip™ U or X series as manufactured by Dietrich Metal Framing, Columbus, OH (614) 438-3210, may be provided for attachment of bridging to studs.
- J. Fasteners: ASTM C1513, self-drilling, self-tapping screws.
- K. Anchorage Devices: Power driven, powder actuated, drilled expansion bolts or screws with sleeves as required for positive anchorage.
- L. Acoustic Sealant: As specified in Section 07 92 00.
- M. Primer: FS TT-P-645, for touch-up of galvanized surfaces.
- N. Backing: Provide backing plate, stud or proprietary backing members of type and configuration indicated on Drawings, and as follows:
 - 1. 16 gauge minimum galvanized steel sheet.
 - 2. 16 gauge minimum c-shaped steel stud.
 - 3. "Notch-Tite" and "Flush Mount" as manufactured by Metal Lite, Inc., 3070 E. Miraloma Avenue, Anaheim, CA 92806 (800) 886-6824.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that conditions are ready to receive Work.
- B. Verify field measurements are as shown on Drawings.
- C. Verify that rough-in utilities are in proper location.
- D. Beginning of installation means acceptance of substrate.

3.02 METAL STUD ERECTION

- A. Install stud framing in accordance with ASTM C 754.
- B. Align and secure top and bottom runners at 24 inches o.c. and within 6 inches from each end. Place two beads of acoustic sealant between runners and substrate.
- C. Fit runners under and above openings; secure intermediate studs at spacing of wall studs.

- D. Install studs vertically at center to center stud spacing indicated in stud schedule on Drawings. Place two beads of acoustic sealant between studs and adjacent vertical surfaces. Install felt strips between wall and stud where studs abut exterior walls.
- E. Connect studs to bottom track using fastener method.
- F. Door Opening Framing: Install double studs at door frame jambs. Install stud tracks on each side of opening, at frame head height, and between studs and adjacent studs.
- G. Backing and Blocking: Provide 16 gauge minimum backing and blocking attached to studs. Bolt or screw steel channels to studs. Install backing and blocking for support of plumbing fixtures, toilet partitions, wall cabinets, building accessories, artwork, Owner furnished televisions and other A/V items, toilet accessories, wall brackets, hardware, and other wall mounted items. If proprietary system is used, install in accordance with Manufacturer's printed instructions.
- H. Coordinate installation of bucks, anchors, blocking, electrical and mechanical Work placed in or behind partition framing.
- I. Splice studs, where necessary, with 8 inch nested lap. Secure each stud flange with flush head screw.
- J. Construct corners using minimum three studs.
- K. Curved or Radius Shapes: Install framing using proprietary curved stud and track components in compliance with manufacturer's instructions.
- L. Brace stud framing system and make rigid.
- M. Coordinate erection of studs with requirements of door and window frame supports and attachments.
- N. Align stud web openings.
- O. Refer to Drawings for indication of partitions extending to ceiling only and for partitions extending through ceiling to structure above. Maintain clearance under structural building members to avoid deflection transfer to studs. Provide nested extended leg ceiling runners, deflection clips or proprietary slip track with studs allowed to float (no screw attachment) to allow for overhead deflection. Install fire rated proprietary slip track at fire rated partitions in accordance with applicable UL assembly and coordinate installation of additional gypsum board strips to comply with assembly requirements.
- P. Coordinate placement of insulation in multiple stud spaces made inaccessible after stud framing erection.

3.03 WALL FURRING INSTALLATION

- A. Erect wall furring for direct attachment to concrete masonry unit walls plumb and true to line using galvanized steel or plastic shims as required to plumb wall.
- B. Erect furring channels vertically. Secure in place on alternate channel flanges at maximum 24 inches.
- C. Space furring channels maximum 16 inches on center, not more than 4 inches from floor and ceiling lines, and butting walls.

- D. Install furring channels directly attached to masonry walls, as applicable in accordance with Manufacturer's instructions.
- E. Erect free-standing metal stud framing tight to concrete, concrete and brick masonry walls, attached by adjustable furring brackets in accordance with Manufacturer's instructions.

3.04 ACOUSTICAL AND FIRE RATINGS

- A. Install framing and furring as required for indicated acoustical and fire ratings.

3.05 CEILING FRAMING INSTALLATION

- A. Install in accordance with ASTM C 754.
- B. Coordinate location of hangers with other Work.
- C. Install suspended ceiling framing independent of walls (except where required for structural support), columns, ducts, pipes, conduit and other obstructions. Where required provide additional suspended structural members in trapeze fashion to span underside of ductwork and other obstructions, with main suspension of ceiling system suspended from the additional members. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
 - 1. Do not attach metal framing to ducts, pipes, conduit and similar items or allow items to come in contact with framing or gypsum board applied to framing.
 - 2. Provide isolation framing assemblies where required for support of framing.
- D. Reinforce openings in ceiling suspension system which interrupt main carrying channels or furring channels, with lateral channel bracing. Extend bracing minimum 24 inches beyond each end of openings.
- E. Design and install interior soffit and ceiling framing in accordance with structural performance requirements of Section 05 41 00.
- F. Laterally brace entire suspension system.
- G. No hanger support shall be allowed from roof deck.
- H. At steel beams, joists or other steel construction wrap hangers around, inset through, or clip or bolt to the supports, so as to develop the full strength of the hangers.
- I. At lights or other openings that interrupt the main runner or furring channels reinforce grille with 3/4 inch channels, wire tied atop and parallel to the main runner channels.
- J. Do not bridge control and expansion joints with metal furring. Provide separate supports on each side of joint.
- K. Curved and/or Radius Shapes: Install framing using proprietary curved stud and track components in compliance with Manufacturer's instructions.

3.06 GRID TYPE CEILING SUSPENSION SYSTEM INSTALLATION

- A. Grid Type Ceiling Suspension System: Install suspension system in accordance with manufacturer's instruction and the following:
 - 1. ASTM C636 and as supplemented in this Section.

2. CISCA's Recommendations for Acoustical Ceilings: Comply with CISCA's "Recommendations for Direct-Hung Acoustical tile and Lay-in Panel Ceilings (zones 0-2).
 3. IBC Chapter 16 requirements for suspended ceilings for Seismic Design Category indicated in General Structural Notes on Drawings.
- B. Install system capable of supporting imposed loads to a deflection of 1/360 maximum.
- C. Install after major above-ceiling Work is complete. Coordinate the location of hangers with other Work.
- D. Provide hanger clips during steel deck erection. Provide additional hangers and inserts as required.
- E. Hang suspension system independent of walls, columns, ducts, pipes, conduit, and other obstructions. Where required, provide additional suspended structural members to form "trapeze" to span underside of ductwork or other obstruction, with main suspension of ceiling system suspended from the additional members.
1. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
- F. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability. Support fixture loads by supplementary hangers located within 6 inches of each corner; or support components independently.

3.07 FIELD QUALITY CONTROL

- A. Testing: At Owner's request, Contractor shall provide spot testing of actual properties of steel framing to verify compliance with specifications.

3.08 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 09 24 00

PORTLAND CEMENT PLASTER (STUCCO)

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. 2-coat portland cement plaster (stucco) (scratch and brown coat) substrate for EIFS finish coat specified in Section 07 24 00.
 - 2. 2-coat Portland cement plaster finish applied over existing interior slump face CMU walls.
- B. Related Sections:
 - 1. Section 07 24 00 – Exterior Insulation and Finish System, for EIFS finish applied to portland cement plaster finish specified in this Section.

1.02 SUBMITTALS

- A. Samples: Submit preliminary texture Samples for interior plaster finish applied over slump face CMU, minimum 2 samples each on 12 inch x 12 inch minimum boards showing range of texture for Architects initial review and approval.

1.03 QUALITY ASSURANCE

- A. Comply with applicable requirements of the following, except where more stringent requirements are specified or required by local building codes:
 - 1. ASTM C1063, "Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster."
 - 2. ASTM C926, "Standard Specification for the Application of Portland Cement-Based Plaster."
 - 3. Technical Services Information Bureau (TSIB).

1.04 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.
- B. Storage: Adequately protect against damage while stored at the site.
- C. Handling: Comply with Manufacturer's instructions.

1.05 ENVIRONMENTAL REQUIREMENTS

- A. Comply with environmental requirements of ASTM C926, and the following:
 - 1. Substrate Temperature: Do not apply portland cement plaster (stucco) to substrates whose temperature are below 40 deg. F (4 deg. C) or contain frost or ice.
 - 2. Inclement Weather: Do not apply portland cement plaster (stucco) during inclement weather, unless appropriate protection is employed.

3. Do not apply stucco base coats or finishes if ambient temperature falls below 40 deg. F (4 deg. C) within 24 hours of application. Protect stucco from uneven and excessive evaporation during dry weather and strong blasts of dry air.
4. Prior to installation, the wall shall be inspected for surface contamination, or other conditions that may adversely affect the performance of the portland cement plaster (stucco), and shall be free of residual moisture.

PART 2 PRODUCTS

2.01 PLASTER (STUCCO) MATERIALS

- A. Water: Clean and free of deleterious matter.
- B. Portland Cement: Conform to ASTM C150, Type I or II.
- C. Hydrated Lime: Conform to ASTM C207, Type S.
- D. Aggregate shall be clean, well graded sand or screenings from crushed stone or slag, and shall conform to ASTM C33 for fine aggregate except that it shall be graded within the following limitations:
 1. Passing No. 4 sieve: 100 percent
 2. Passing No. 8 sieve: 90 percent
 3. Passing No. 16 sieve: 60 percent-90 percent
 4. Passing No. 30 sieve: 35 percent-70 percent
 5. Passing No. 50 sieve: 10 percent-30 percent
 6. Passing No. 100 sieve: 5 percent
- E. Bonding Agent: ASTM C31; type recommended for bonding stucco to concrete and concrete masonry, non-emulsifying.
- F. EIFS Finish: As specified in Section 07 24 00.

2.02 FURRING, LATHING AND ACCESSORIES

- A. Metal Lath: 2.5 lb./sq.yd. expanded metal, continuous v-groove, self-furring type lath complying with ASTM C847; fabricated from galvanized steel sheet complying with ASTM A653, galvanized finish.
- B. Corner Mesh: Formed steel, minimum 26 gauge; expanded flanges shaped to permit complete embedding in plaster; minimum 2 inches wide; G90 galvanized finish.
- C. Corner Beads: Formed steel, minimum 26 gauge; beaded or bullnosed edge as selected by Architect, of longest possible length; sized and profiled to suit application; G90 galvanized finish.
- D. Base Weep Screeds: Formed steel, minimum 26 gauge; square edge, of longest possible length; sized and profiled to suit application; galvanized finish.
- E. Casing Bead: Formed steel; minimum 26 gauge; thickness governed by plaster thickness; maximum possible lengths; expanded metal flanges, with square or bull-nosed edges as indicated on Drawings or as selected by Architect; G90 galvanized finish.
- F. Control Joint Accessory: Formed steel; minimum 26 gauge; galvanized finish; double J-Type vertical, double V-Type horizontal, 2 inch expanded metal flanges each side; G90 galvanized finish.

- G. Expansion Joint Accessory: M-Slide Expansion Joint as manufactured by CEMCO. Formed galvanized steel, 26 gauge; CEMCO M-slide profile, 2 inch expanded metal flanges each side; G90 galvanized finish.
- H. Flashing Reglets: As specified in Section 07 60 00.
- I. Anchorages: Nails, staples, or other approved metal supports, of type and size to suit application, galvanized to rigidly secure lath and associated metal accessories in place.
- J. Galvanizing: All furring, lathing, trim and accessories shall have a G60 galvanized finish for interior locations and a G90 galvanized finish for exterior locations.

2.03 PROPORTIONING AND MIXING

- A. Accurately measure ingredients. Proportion successive batches exactly alike. Mix aggregate, cement and other dry materials until the mass is uniform in color, consistency and homogeneous before adding water. Determine the quantity of water necessary for the desired consistency by trial, and thereafter measure in proper proportions. Re-tempering will not be allowed.
- B. Mortar for coats shall consist of one volume of portland cement to not less than three or more than five volumes of damp, loose aggregate.
- C. Hydrated lime, hydrated lime putty, or slaked lime putty may be added as a plasticizing agent, but the amount used shall not exceed 10 percent by weight nor more than 25 percent by volume of the cement used.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces and supports to receive Work and report detrimental conditions in writing, with a copy to Architect. Commencement of Work will be construed as acceptance of subsurfaces. Verify, before proceeding with this Work that required inspections of existing conditions have been completed.
- B. Coordination with other Work: Coordinate with other Work which affects, connects with, or will be concealed by this Work. Before proceeding, make certain required inspections have been made.

3.02 LATH AND TRIM INSTALLATION

- A. Lathing: Comply with ASTM C1063, and the following:
 - 1. Install lath at interior locations over slump face CMU walls.
 - 2. No lath is required at exterior walls where stucco is substrate for EIFS finish.
 - 3. Install lath with the long dimensions of the sheet across supports and attach to the studs or furring using 18 gauge tie wire, or by nailing or by equivalent attachment spaced at intervals not exceeding 6 inches along such studs or furring members. Make end laps of lath only over supports and stagger end laps in adjacent courses.
 - 4. Place 6 inch wide x 12 inch long strips of metal lath diagonally at corners of openings; secure rigidly in place.

- B. Metal Trim, Joint Assemblies, Reveals, etc.: Comply with ASTM C1063 and the following. Securely fasten trim members to maintain their position in accordance with recommended practice.
 - 1. Install casing beads where stucco terminates against dissimilar materials.
 - 2. Install reveals and other trim at locations indicated on Drawings.
 - 3. Control and Expansion Joints: Locate and install control joints at locations indicated on Drawings, but not more than the maximum spacing and panel size recommendations of ASTM C1063 as approved by the Architect, and as follows:
 - a. Install control joints directly over any expansion or contraction joints in the surface of the underlying construction.
 - b. Install control joints directly over joint between changes in substrate materials.
 - c. Wall Area: Install control joints in walls to create wall areas of not more than 144 sq. ft. in area and not more than 100 sq. ft. for all ceilings, curves, or angular plaster surfaces.
 - d. Joint Spacing: Install control joints at maximum 18 ft spacing in either direction or a length-to-width ratio of 2-1/2 to 1.

3.03 STUCCO APPLICATION

- A. Application, General: Comply with ASTM C926, recommendations of the TSIB, and the following.
- B. Temperature shall be 45 degrees F. and rising during application and for 48 hours thereafter.
- C. Apply scratch coat with sufficient pressure so that it is forced through the metal reinforcement and against the backing to form full keys and to embed reinforcement completely. Apply to an approximate thickness of 3/8 inch from the face of the backing. Scratch to provide bond for succeeding coat.
- D. Exterior Smooth Masonry Substrates (Base for EIFS Finish): Apply brown coat directly over masonry, proportioned as specified above. Dampen surface evenly to obtain uniform suction. Apply to an approximate thickness of 3/8 inch. Bring surface to a true, even surface by floating or rodding, leave rough ready to receive finish coat. Cure for 7 days by keeping moist.
- E. Apply brown coat not sooner than 48 hours after the application of the scratch coat. Dampen scratch coat evenly to obtain uniform suction. Apply to an approximate thickness of 3/8 inch.
 - 1. Finish Textures: Provide finish textures of types indicated below, complying with the TSIB; Plaster Textures.
 - a. Exterior Walls, Base for EIFS Finish: Smooth sand finish acceptable to receive EIFS finish.
 - b. Interior Walls: Smooth float finish suitable for paint finish as approved by Architect.
- F. When applying the finish, plan Work so entire wall can be completed at one time to eliminate joining marks. If not practical, use a corner, door or window as a breaking point.
- G. Curing: Keep each coat of stucco damp for at least 48 hours after application; moistening of each coat shall begin as soon as the stucco has hardened sufficiently so as not to be injured. Apply water in a fine fog spray. Avoid soaking the wall. Apply only as much water as can be readily absorbed.

3.04 REPAIRS

- A. Remove and replace stucco which has cracks, blisters, pitting, or other defects.
- B. Repairing of defects will be permitted only when approved by the Architect.
- C. Repairs shall match existing Work.

3.05 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 09 29 00

GYPSUM BOARD

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Gypsum board and installation accessories as shown on Drawings and as specified herein.
 - 2. Patching and repair of existing walls to remain in the final Work where indicated or damaged as a result of selective demolition operations.

1.02 SYSTEM DESCRIPTION

- A. Acoustical Attenuation for Interior Partitions: Comply with STC rating indicated for Partition Types indicated on Drawings and in accordance with ANSI/ASTM E90.

1.03 SUBMITTALS

- A. Product Data: Submit data on gypsum board, joint, finish and accessories.
- B. Samples: Submit sample of textured finish prior to application.
- C. Reports: Submit fire test report for fire rated assemblies and acoustical performance test reports for acoustically-rated assemblies.

1.04 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in Gypsum Board Systems Work with 2 years documented experience and approved by Manufacturer.
- B. Regulatory Requirements: Conform to applicable code for fire rated assemblies as shown on the Drawings.
- C. Comply with applicable specification recommendations of GA-216 and GA-600 as published by the Gypsum Association.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Comply with GA-216 and Manufacturer's directions.

1.06 PROJECT CONDITIONS

- A. Environmental Requirements:
 - 1. Maintain temperature of installed gypsum board spaces in range of 55 degrees F. to 90 degrees F. until building is entirely closed, in accordance with Gypsum Association GA-220 and GA 236.
 - 2. Ventilate as required to eliminate excessive moisture.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the following Manufacturers, except as approved by the Architect, subject to compliance with Specification requirements:
 - 1. G-P Gypsum www.gp.com/gypsum/
 - 2. Gold Bond Building Products Div., National Gypsum Co. www.nationalgypsum.com
 - 3. United States Gypsum Co. www.usg.com
 - 4. CertainTeed (BPB Gypsum) www.bpb-na.com
 - 5. Pabco Gypsum www.pabco gypsum.com

2.02 GYPSUM BOARD MATERIALS

- A. Standard Gypsum Board: ANSI/ASTM C36 or ASTM C1396; 5/8 inch thick, maximum permissible length; ends square cut, tapered edges. Provide sag-resistant type for ceiling applications.
- B. Fire Rated Gypsum Board: ANSI/ASTM C36 or ASTM C1396; fire resistive type, UL rated; 5/8 inch, maximum permissible length; ends square cut, tapered edges. Provide sag-resistant type for ceiling applications.
- C. Moisture Resistant Gypsum Board: DensArmor Plus Interior Guard moisture, mold and mildew resistant coated glass mat faced gypsum core panels complying with ANSI/ASTM C630 or ASTM C1177, and resistant to mold and mildew per ASTM D3273, as manufactured by G-P Gypsum Corporation; 5/8 inch thick, maximum permissible length; tapered edges. Provide DensArmor Plus Fireguard, 5/8 inch panels where indicated.
- D. Flexible Gypsum Board: ANSI/ASTM C36; 1/4 inch thick, maximum permissible length; ends square cut, tapered edges. Provide Gold Bond 1/4 inch High Flex Wallboard, or as approved.
- E. Glass-Matt Faced Exterior Gypsum Sheathing Board: As specified in Section 09 29 13 – Exterior Gypsum Sheathing.
- F. Ceramic Tile Backer Board: As specified in Section 09 30 00 - Ceramic Tile.

2.03 ACCESSORIES

- A. Adhesive: ASTM C557.
- B. Acoustical Sealant: As specified in Section 07 92 00.
- C. Corner Beads: GA216; Type CB; electro-galvanized steel.
- D. Edge Trim: GA216; Type L or J bead; electro-galvanized steel and Type LC rolled-formed zinc. Milcore No. 66 J-metal edge, or as approved by Architect, where indicated at unfinished gypsum board edges against other finish materials.
- E. Control Joint: No. 093, roll-formed zinc, as manufactured by U.S.Gypsum, Unimast, or Dietrich.
- F. Reveals: 6063 T5 extruded aluminum or electro-galvanized steel, baked-on primer finish. Fry Reglet profiles indicated on Drawings, or equivalent as approved by Architect.

- G. Joint Materials: ANSI/ASTM C475; reinforcing tape, joint compound, adhesive, water, and fasteners. For coated board and gypsum sheathing, use material recommended by Board Manufacturer.
 - 1. Use 2 inch wide 10 x 10 glass mesh tape at moisture resistant gypsum board.
 - 2. Use only setting type joint compound at moisture resistant gypsum board.
- H. Screws: ASTM C1002 for steel drill screws. Type G for fastening to gypsum board, Type S for fastening to light gauge steel framing and Type W for fastening to wood framing.
- I. Wall Texture: As manufactured by USG, multi-purpose, pre-packaged, non-asbestos type.
- J. Drywall Primer:
 - 1. Paint material specifically formulated to fill the pores and equalize the suction difference between gypsum board surface paper and the compound used on finished joints, angles, fastener heads and accessories and over skim coatings.
 - 2. Drywall primer which is applied to the finished surface of the work specified in this section shall be provided as specified under Sections 09 91 00 and 09 72 00 as applicable.
 - 3. A good quality, white latex drywall primer formulated with high binder solids, applied undiluted, and shall be applied to gypsum board surfaces prior to the application of texture materials.

PART 3 EXECUTION

3.01 INSPECTION

- A. Verify that site conditions are ready to receive Work and opening dimensions are as instructed by the Manufacturer.
- B. Beginning of installation means acceptance of substrate.

3.02 GYPSUM BOARD INSTALLATION

- A. Install gypsum board in accordance with GA-201, GA-216, and ASTM C840 and Manufacturer's instructions as applicable.
- B. Erect single layer standard gypsum board in most economical direction, with ends and edges occurring over firm bearing.
- C. Erect single layer fire rated gypsum board vertically, with edges and ends occurring over firm bearing.
- D. Ceiling Boards:
 - 1. Install gypsum panels prior to wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
 - 2. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- E. Use screws when fastening gypsum board to metal framing.
- F. Double and Multi-Layer Applications:
 - 1. Place first layer perpendicular to framing or furring members.
 - 2. Use fire rated gypsum board for fire rated partitions.

3. Place second layer perpendicular to first layer.
 4. Offset joints of second layer from joints of first layer.
 5. Do not glue laminate. Screw successive layers of wallboard to framing members only; use screws of sufficient length to penetrate framing members and assure a permanent solid connection thereto.
- G. Flexible Gypsum Board - Double Layer Application:
1. Apply stop to one end of the concave curved wall to resist strain.
 2. Apply pressure to the unrestrained end of the board forcing the field of the gypsum board into firm contact with the framing.
 3. Fasten gypsum board working from the “stopped” end or edge.
 4. Hold gypsum board in firm contact with framing members while fastening.
 5. Offset joints of second layer from joints of first layer.
 6. Secure second layer through first layer to framing in same manner as first layer.
- H. Treat cut edges and holes in moisture resistant gypsum board with sealant.
- I. Place control joints and reveals consistent with lines of building spaces as indicated on Drawings and as recommended by Board Manufacturer.
- J. Place corner beads at external corners. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials. Use J-metal edge where indicated at unfinished gypsum board edges against other finish materials.
- K. Gypsum board placed to infill areas removed during selective demolition operations or as required to patch and repair shall be placed to provide smooth seamless transition to existing surface. Cut existing gypsum board back to provide straight vertical and horizontal edges. Provide additional blocking and support at cut edges as necessary for firm secure attachment of infill panel.

3.03 JOINT TREATMENT

- A. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
- B. Feather coats onto adjoining surfaces so that camber is maximum 1/32 inch.
- C. Taping, filling, and sanding is not required at surfaces behind ceramic tile.

3.04 ACOUSTICAL WALLS AND TREATMENT

- A. Install acoustical sealant in accordance with Manufacturer's instructions and Section 07 92 00.
- B. Install acoustical sealant at gypsum board perimeter at:
 1. Metal framing: Two beads.
 2. Base layer of double layer applications, if applicable.
 3. Face layer.
 4. Seal all around all gypsum board penetrations by conduit, pipe, ductwork, and rough-in electrical/telephone boxes, etc.
- C. Install acoustical sealant where gypsum board joins other walls or surfaces at sound control partitions.

3.05 FINISHING OF GYPSUM BOARD SURFACES

- A. Provide finish of gypsum board surfaces in accordance with the Gypsum Association "Recommended Specification: Levels of Gypsum Board Finish" as follows as noted on Room Finish Schedule:
1. Level 0 (Temporary Construction): No taping, finishing, or accessories required.
 2. Level 1 (Fire Taping at plenum areas above ceiling, in attics, in areas where the assembly will be concealed or in building service corridors and other areas not normally open to public view):
 - a. Joints and interior angles shall have tape embedded in joint compound.
 - b. Surface shall be free of excess joint compound.
 - c. Tool marks and ridges are acceptable.
 3. Level 2 (Water resistant gypsum backing for tile) (Areas to receive ceramic tile, applied products, etc., except where product being installed requires a higher level of finish.):
 - a. Joints and interior angles shall have tape embedded in joint compound and wiped with a joint knife leaving a thin coating joint compound over joints and interior angles.
 - b. Fastener heads and accessories shall be covered with a coat of joint compound.
 - c. Surface shall be free of excess joint compound.
 - d. Tool marks and ridges are acceptable.
 - e. Joint compound applied over the body of the tape at the time of tape embedment shall be considered a separate coat of joint compound and shall satisfy the conditions of this level.
 4. Level 3 (Utility, Equipment, Mechanical, Janitor Rooms, and Similar Spaces) (Appearance areas to receive heavy or medium texture (spray or hand applied) finishes before final painting.):
 - a. Joints and interior angles shall have tape embedded in joint compound and one additional coat of joint compound applied over joints and interior angles.
 - b. Fastener heads and accessories shall be covered with 2 separate coats of joint compound.
 - c. Joint compound shall be smooth and free of tool marks and ridges.
 - d. Surface to be coated with Drywall Primer as specified herein prior to application of texture.
 - e. Untextured surfaces to be coated with Drywall Primer prior to application of final finishes as specified in Sections 09 91 00 and 09 72 00, as applicable.
 5. Level 4: Standard level of finish for all areas, unless otherwise indicated or approved by Architect. (Appearance areas to receive light texture):
 - a. Joints and interior angles shall have tape embedded in joint compound and 2 separate coats of joint compound applied over flat joints and one separate coat of joint compound applied over interior angles.
 - b. Fastener heads and accessories shall be covered with 3 separate coats of joint compound.
 - c. Joint compound shall be smooth and free of tool marks and ridges.
 - d. Surface to be coated with Drywall Primer as specified herein prior to application of texture.
 - e. Untextured surfaces to be coated with Drywall Primer prior to application of final finish as specified in Section 09 91 00.
 6. Level 5: Not Used.
- C. Surfaces shall be free of dust, dirt and oil and shall received Drywall Primer before application of texture or skim coat as required by the manufacturer of the texture or skim coat materials.

- D. Surface Finish: Produce surface finish to match approved sample, type as indicated below.
 - 1. Light skip trowel finish to match existing as approved by Architect. Medium skip trowel finish is acceptable at Utility, Equipment, Janitor and similar spaces
- E. Do not wash joint compound or wall finish materials down site drains.

3.06 CLEANING

- A. After completion of wallboard installation, taping and texturing, remove rubbish, excess material and equipment from building and job site, leaving floors and other surfaces clean.
- B. Remove overspray from adjoining construction.
- C. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition.

3.07 PROTECTION

- A. Protect Work from damage until acceptance.
- B. Repair or replace damaged Work.

END OF SECTION

SECTION 09 29 13

EXTERIOR GYPSUM SHEATHING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Glass-mat faced water-resistant exterior gypsum sheathing as shown on Drawings and as specified herein.

1.02 DEFINITIONS

- A. Gypsum Board Construction Terminology Standard: Refer to ASTM C1177 and GA 505 for definitions of terms for gypsum board construction not otherwise defined in this Section or other referenced standards.

1.03 SUBMITTALS

- A. Product Data: Submit Manufacturer's descriptive literature including product specifications, material composition, thickness, sizing, fire resistant properties, design data and installation instructions.
- B. Certificates: Submit Manufacturers' written certificate that products furnished under this section meet the specified requirements.
- C. Contract Closeout Submittals: Submit the following in accordance with Section 01 77 00 - Contract Closeout.
 - 1. Copy of Warranty.

1.04 QUALITY ASSURANCE

- A. Installers Qualifications: Employ installers with sufficient skills and who are thoroughly familiar with the type of construction involved and the materials and techniques specified for this work.
- B. Comply with applicable specification recommendations of GA-216 and GA-600 as published by the Gypsum Association.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging, containers, and bundles with Manufacturer's brand, product identification markings and brand intact.
- B. Storage: Store panels flat and level in an enclosed shelter providing protection from damage and exposure to the elements. Insure adequate air circulation is allowed around material stacks.
- C. Handling: When loading, unloading, and moving materials use care not to cause breakage or edge damage.

1.06 SEQUENCING AND SCHEDULING

- A. Sequence installation of exterior gypsum sheathing so sheathing will not be left exposed longer than recommended by manufacturer or 180 days, whichever is less, prior to installation of exterior cladding.

1.07 WARRANTY

- A. Furnish Manufacturer's standard 10 year limited warranty covering defects in manufacturing and materials and maximum 1 year exposure warranty stating that product will remain free of defects and suitable for its intended use after installation, but before the exterior weather-resistive barrier or cladding is installed on the building, regardless of exposure to normal weather conditions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the following Manufacturers, except as approved otherwise by the Architect, subject to compliance with Specification requirements:
 - 1. G-P Gypsum www.gp.com
 - 2. Certaineed www.bpb-na.com/us/english/high_performance_sheathing/index.php
 - 3. Temple-Inland www.templeinland.com
 - 4. USG www.usg.com

2.02 MATERIALS

- A. Glass Mat Faced Exterior Sheathing Board: Glass-mat faced exterior gypsum sheathing complying with ASTM C1177.
 - 1. Thickness: 1/2 inch, unless otherwise indicated on Drawings.
 - 2. Acceptable Products: Subject to compliance with requirements, provide one of the following:
 - a. Dens-Glass Gold Sheathing, G-P Gypsum Corporation.
 - b. GlasRoc Sheathing, Certaineed.
 - c. GreenGlass Fiberglass-Faced Gypsum Sheathing, Temple-Inland.
 - d. Securock Glass-Mat Sheathing, USG
- B. Where glass-mat faced exterior gypsum sheathing is indicated at the back of parapet walls indicated to receive roofing materials, provide the following:
 - 1. Glass Mat Faced Gypsum Roof Board:
 - a. Dens Deck / Dens Deck Prime / Dens Deck Duraguard (as recommended by the roofing system manufacturer and as part of a tested roofing assembly); G-P Gypsum Corporation.

2.03 ACCESSORIES

- A. Fasteners: Type S-12, bugle head, self-tapping, with organic-polymer or other protective coating having a salt-spray resistance of more than 800 hours as tested in accordance with ASTM B117, and as follows:
 - 1. Provide steel drill screws complying with ASTM C1002 to attach sheathing to steel framing less than 0.03 inch thick.
 - 2. Provide steel drill screws complying with ASTM C954 to attach sheathing to steel framing from 0.03 inch to 0.112 inch thick.
 - 3. Length: As recommended to penetrate metal framing minimum depth as recommended by sheathing Manufacturer.

- B. Joint Treatment Materials:
 - 1. Joint Sealant: Silicone emulsion sealant complying with ASTM C834 and compatible with sheathing and sheathing tape as recommended by the sheathing Manufacturer. Provide one of the following:
 - a. Dow Corning 795 Building Sealant.
 - b. Pecora 895.
 - 2. Glass Fiber Sheathing Tape: Provide self-adhering glass-fiber tape, 2 inch minimum width, 10 x 10 or 10 x 20 threads/inch mesh, of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing board with a history of successful in-service use.
- C. Edge Trim: GA216; Type L bead; electro-galvanized steel and Type LC rolled-formed zinc.
- D. Butyl Rubber Flashing Membrane: Grace Vycor Butyl, Grace Construction Products, self-adhering, butyl rubber based adhesive and polyethylene flashing, 6 inch or 9 inch widths as appropriate for flashing condition.
 - 1. Primer: Perm-A-Barrier WB Primer, Grace Construction Products.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Verify that surface of framing members do not vary more than 1/4 inch from the plane of faces of adjacent members.
- C. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

- A. Glass Mat Exterior Sheathing Board:
 - 1. Install in accordance with GA-253, ASTM C1280, IBC requirements and manufacturer's printed instructions.
 - 2. Verify that surface of framing members do not vary from more than 1/4 inch from the plane of faces of adjacent members.
 - 3. Install glass mat gypsum sheathing with logo side out.
 - 4. End joints shall be offset. Joints should fit snugly and flashing installed around openings.
 - 5. Panels of the maximum length possible shall be used to minimize the number of joints. Edge joints must be located parallel to and with vertical orientations on framing. End joints of adjacent lengths of sheathing must be staggered.
 - 6. Cut boards at penetrations, edges, and other obstructions of work; fit tightly against abutting construction, unless otherwise indicated.
 - a. Install boards with 3/8 inch setback where non-load-bearing construction abuts structural elements.
 - b. Install boards with 1/4 inch setback where they abut masonry or similar materials that might retain moisture, to prevent wicking.
 - c. Allow no joints greater than 3/8 inch.

7. Coordinate sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevents exterior moisture from passing through completed exterior wall assembly.
 8. Attach sheathing to metal framing with screws spaced 8 inches o.c. at perimeter and 8 inches o.c. in field.
 9. Install fasteners so screw heads bear tightly against and flush with surface of sheathing but do not cut into facing. Fasteners must not be countersunk.
 10. Do not bridge building expansion joints with sheathing; cut and space edges to match spacing of structural support elements.
- B. Horizontal Installation: Install 2-foot-wide gypsum sheathing boards horizontally with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent boards without forcing. Abut ends of boards over centers of stud flanges and stagger end joints of adjacent boards not less than one stud spacing, two where possible. Screw-attach boards at perimeter and within field of board to each steel stud as follows:
1. Fasteners spaced maximum 8 inches o.c. and set back 3/8-inch minimum, 1 inch maximum from edges and ends of boards.
- C. Vertical Installation: Install 4-foot-wide gypsum sheathing boards vertically with vertical edges centered over flanges of steel studs. Abut ends and edges of each board with those of adjoining boards. Screw-attach boards at perimeter and within field of board to each steel stud as follows:
1. Fasteners spaced maximum 8 inches o.c. along perimeter and in the field of the board, and set back 3/8-inch minimum, 1 inch maximum from edges and ends of boards.
- D. Joint Treatment: Treat joints of installed glass matt gypsum sheathing in accordance with one of the following:
1. Apply 3/8 inch bead of sealant to all joints and trowel in firmly until flat. Use backer rod for joints larger than 1/8 inch. Apply enough of the same material to each fastener to cover completely when troweled flat.
 2. Apply glass mesh joint tape to all joints, overlapping at intersections by the width of the tape. Apply approximately 3/8 inch bead of sealant over the applied tape over the joint and embed the sealant into the entire surface of the tape with a trowel. Use backer rod for joints larger than 1/8 inch. Apply enough of the same material to each fastener to cover completely when troweled flat.
- E. Ceiling/Soffit Applications: Install with long edges in contact with edges of adjacent boards without forcing. Abut ends of boards over centers of stud flanges and stagger end joints of adjacent boards not less than one stud spacing. Attach boards at perimeter and within field of board to each stud.
1. Space fasteners a maximum of 8 inches o.c., or tighter where recommended by the sheathing Manufacturer, and a minimum of 3/8 inch from edges and ends of boards.
 2. Apply joint tape over joints and embed in setting type joint compound. Skim coat entire surface with setting type joint compound for smooth finish, except where ceiling or soffit board serves as a base to another applied finish (DFS, EIFS, etc).
- F. Flashing Membrane: Apply flashing membrane in accordance with Manufacturer's instructions around all openings in exterior gypsum sheathing. Apply flashing membrane primer on all concrete, masonry and glass-matt faced gypsum sheathing surfaces prior to adhering flashing membrane.

3.03 CLEANING

- A. During the course of the Work and on completion of the Work, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 09 30 00

TILE

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes ceramic, porcelain, mosaic, and similar tile products and installation materials shown on Drawings and as specified herein.

1.02 SUBMITTALS

- A. Product Data: Submit Manufacturer's data for tile and accessory materials, including recommended procedures for mixing materials and setting tile for each application type.
- B. Samples: Submit a minimum of four samples of each type of ceramic tile required and associated grout type and manufacturers selection of colors, marked with Manufacturer's name and location where tile is to be installed. Tile and Grout color samples shall be submitted within the same submittal package.

1.03 QUALITY ASSURANCE

- A. Comply with applicable requirements of ANSI A-108 Series and the TCNA "Handbook for Ceramic Tile Installation." Tile shall bear the TCNA grade seal.
- B. Pre-Installation Meeting: Prior to commencing the work of this Section, schedule and attend a meeting at the job site to discuss conformance with Project requirements.
- C. Blending: Tile Manufacturer to blend tile at the factory.
 - 1. Provide additional blending at the job site as needed to obtain the Architect's approval.
- D. Mock-ups: Provide job site mock-ups of each type of tile, minimum of 4 square feet for tile 4 inches or less in dimension and 16 sq ft in size for larger size tile units, which will be used as data for comparison with the remainder of the work of this Section for the purposes of acceptance or rejection. Grout widths shall be verified and approved in the Mock-up.
- E. Static Coefficient of Friction: Provide floor tile products and finished floor tile installation with a wet DCOF of 0.42 or greater when tested with the BOT-3000 using SLS solution per procedures in ANSI A137.1.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver manufactured materials in original, unbroken containers bearing name of Manufacturer, brand and grade seals. Keep materials dry, clean and protected against deterioration.

1.05 MAINTENANCE

- A. Extra Materials: Furnish one (1) square foot of tile for each 100 square feet of each color and size of tile and grouting materials used in the Project. If less than 100 square feet is installed, provide a minimum of one square foot of extra stock. Extra materials shall be furnished in original packaging.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the following Manufacturers, except as otherwise approved by the Architect, subject to compliance with Specification requirements.
1. Tile Products: Provide products of manufacturers scheduled below under Tile Materials Article.
 2. Setting and Grouting Materials:
 - a. Bostik – Hydroment www.bostik-us.com
 - b. C-Cure, as mfrd by Bonded Materials Company www.c-cure.com
 - c. Custom Building Products www.custombuildingproducts.com
 - d. Laticrete www.laticrete.com
 - e. MAPEI Corporation www.mapei.com
 - f. Tec Specialty Products, Inc., an H.B. Fuller comp. www.tecspecialty.com

2.02 TILE MATERIALS

- A. Ceramic, Porcelain, Mosaic and Other Tile: Provide the following:
1. CT-1:
 - a. Manufacturer: Ragno
 - b. Size: 20 x 20
 - c. Series/Color: Burgandy / Noce
 - d. Supplier: Arizona Tile
 2. CT-2:
 - a. Manufacturer: Ragno
 - b. Size: 3 x 13 SBN
 - c. Series/Color: Burgandy / Noce
 - d. Supplier: Arizona Tile
 3. CT-3:
 - a. Manufacturer: Refin Ceramiche
 - b. Size: 12 x 12
 - c. Series/Color: Fabula / Beige
 - d. Supplier: Arizona Tile
 4. CT-4:
 - a. Manufacturer: Refin Ceramiche
 - b. Size: 6 x 12 Cove Base
 - c. Series/Color: Fabula / Beige
 - d. Supplier: Arizona Tile
 5. CT-5:
 - a. Manufacturer: Refin Ceramiche / Daycraft
 - b. Size: 2 x 2 Mosaic
 - c. Series/Color: Fabula / Beige
 - d. Supplier: Arizona Tile
 6. CT-6:
 - a. Manufacturer: Refin Ceramiche
 - b. Size: 3 x 13 SBN
 - c. Series/Color: Fabula / Beige
 - d. Supplier: Arizona Tile
- B. Trim Shapes: Provide Manufacturer's full selection of trim shapes as required
1. Provide all bases, caps, stops, returns, trimmers, and other shapes indicated or required to produce a completely finished installation.
 2. Except as may be shown otherwise on the Drawings, provide color and finish matching the adjacent tile.
 3. Base: Provide base of tile, size, color and pattern scheduled on Drawings.

2.03 INSTALLATION MATERIALS

- A. Mortar Bed for Mud Set Method:
 - 1. Portland cement: ASTM C150, Type 1.
 - 2. Sand: ASTM C144.
 - 3. Mortar: One part Portland cement to 6 parts damp sand by volume.
- B. Mortar for Thin Set Installation: Stain-resistant, latex modified portland cement mortar per A118.4 and applicable TCNA Method.
- C. Epoxy Mortar: Epoxy resin and epoxy hardener in accordance with ANSI 118.3 and applicable TCA method.
- D. Grout: All grout shall be stain resistant type.
 - 1. Epoxy grout: Chemical-resistant per ANSI 118.3, water-cleanable during installation, by an approved Manufacturer. Epoxy grout is used at all locations.
 - 2. Color(s): As indicated on Drawings, or if not indicated, as selected by Architect.

2.04 ACCESSORIES

- A. Ceramic Tile Backer Units: Provide one of the following. Furnish units with manufacturer's recommended joint tape. Moisture resistant gypsum board is not allowed as a substrate for tile.
 - 1. Cement Backer Board: Provide cementitious backer units complying with ANSI 118.9.
 - a. Thickness: 1/2 inch. Provide 5/8 inch Type X where tile backer units are part of a fire rated partition assembly.
 - b. Subject to compliance with requirements, provide one of the following:
 - 1) C-Cure; C-Cure Board 990.
 - 2) Custom Building Products; Wonderboard.
 - 3) Fin Pan Inc., Util-A-Crete Concrete Backer Board.
 - 4) USG Corporation; DUROCK Cement Board.
 - 2. Fiberglass-Mat Faced Gypsum Backing Board: ASTM C1178:
 - a. Thickness: 1/2 inch. Provide 5/8 inch Fireguard Type X where tile backer units are part of a fire rated partition assembly.
 - b. Edges: Square.
 - c. Surfacing: Coated fiberglass mat on face, back, and long edges.
 - d. Mold Resistance (ASTM D3273): 10, in a test as manufactured.
 - e. Permeance (ASTM E96): Not more than 1.0 perms when tiled.
 - f. Acceptable Products:
 - g. Subject to compliance with requirements, provide the following:
 - 1) 1/2 inch DensShield or 5/8 inch DensShield Fireguard Type X, Georgia-Pacific Gypsum.
- B. Welded Wire Fabric Reinforcement:
 - 1. Provide 2 inch x 2 inch mesh of 16/16 gauge wire, or 3 inch x 3 inch mesh of 13/13 gauge wire, or 1-1/2 inch x 2 inch mesh of 16/13 gauge wire, complying with ASTM A185.
 - 2. Provide mesh in flat sheets, or flatten before installing.
- C. Metal Lath:
 - 1. Provide flat expanded type, weighing not less than 2.5 lbs. per square yard.
 - 2. Provide galvanized material and comply with ANSI A42.3.

- D. Expansion/Control Joint Backing Material: Provide closed cell polyethylene foam weighing not less than 2.7 lbs. per cubic feet, and in dimension approximately 20 percent thicker than width of the expansion joint in which used.
- E. Expansion/Control Joint Sealant: Provide in colors selected by the Architect, complying with requirements of Section 07 92 00.
 - 1. At joints between floors and walls, and at perimeter of metal door frames, provide one-part low modulus moisture cure silicone rubber sealant conforming to FS TT-S-001543A, Class A, FS TT-S-00230C, Type II, Class A and ASTM C 920, Type S, Grade NS, Class 25, Use NT, M, G, A, and O.
 - 2. At joints in traffic areas, and at perimeter joints, provide two-part polyurethane material conforming to ASTM C920, Type M, Grade P, Class 25, Use T, with Shore A hardness of 35 - 45.
- F. Edge and Transition Strips: Solid brass, extruded aluminum, or roll-formed stainless steel edge, transition and cove strips, height and/or size as indicated; with integral perforated anchoring leg for setting the strip into the setting material. Refer to Drawings for locations.
 - 1. Height: As required to suit application, flush with finished floor surface.
 - 2. Finish: As indicated on Drawings, or as selected by Architect.
 - 3. Products: Subject to compliance with specification requirements, provide one of the following as selected by Architect, unless otherwise indicated on Drawings:
 - a. Schlüter – SCHIENE, DECO, RENO, or DILEX as indicated on Drawings or as selected by Architect.
- G. Waterproofing and Crack Isolation Membrane: Provide one of the following:
 - 1. Laticrete Hydro Ban Waterproofing and Crack Isolation Membrane; Laticrete International.
 - 2. RedGard Waterproofing and Crack Prevention Membrane, Custom Building Products.
 - 3. UltraCure 971 Elastomeric Waterproofing and Crack Isolation Membrane, C-Cure.
- H. Pre-Manufactured Shower Curb: Solid expanded polystyrene core with bonded waterproof acrylic polymer or PVC finish for thin-set installation of ceramic tile.
 - 1. Acceptable Products:
 - a. Noble Shower Curb as manufactured by Noble Company www.noblecompany.com.
 - b. RedGard HardCurb as manufactured by Custom Building Products www.custombuildingproducts.com.
- I. Tile and Grout Sealer: Colorless, penetrating, stain-resistant sealer recommended tile and grout manufacturers for type of tile and grout indicated.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine subsurfaces to receive Work and report detrimental conditions in writing. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Coordinate with other Work which affects, connects with or is concealed by this Work. Before proceeding, make certain required inspections have been made.

- C. Where a Portland cement mortar setting will be installed, do not commence installation of the setting bed until substrata are within the following tolerances:
 - 1. Horizontal surfaces: Level within 1/4 inch in 10'-0" in all directions.
- D. Where tile units will be thin-set directly to the substrata, do not commence installation of the tile units until substrata are within the following tolerances:
 - 1. Horizontal surfaces: Level within 1/8 inch in ten feet in all directions;
 - 2. Vertical surfaces: Level within 1/8 inch in eight feet in all directions.
 - 3. Deflection:
 - a. Horizontal Surfaces: Less than 1/360 of the span.
 - b. Vertical Surfaces: Verify that design of the wall or partition will not permit deflection exceeding 1/360 of the span for point and uniform loading. Space wood or metal studs not less than 16 inches on centers.
- E. Fill low spots and grind or sand high spots to provide required tolerances. Use latex modified Portland cement based trowelable leveling and patching compound to fill holes, cracks and depressions in accordance with tile setting materials printed instructions.
- F. Conditions of Surfaces to Receive Tile:
 - 1. Verify that surfaces to receive tile are firm, dry clean, and free from oily or waxy films and curing compounds.
 - 2. Verify that grounds, anchors, plugs, recess frames, bucks, electrical work, mechanical work, and similar items in or behind the tile have been installed before proceeding with installation of tile.
 - 3. Scarify hard steel trowel finish concrete surfaces.
 - 4. Completely remove curing compounds on concrete surfaces by scarification or cleaning methods acceptable to tile setting materials manufacturer.

3.02 PREPARATION

- A. Lay out Work so that no tile of less than half size occurs.
 - 1. For heights stated in feet and inches, maintain full courses to produce nearest attainable heights without cutting tile.
 - 2. Align joints in wall tile vertically and horizontally except where other patterns are shown or specified. Align joints in walls to conform to patterns selected.
 - 3. Align joints in floor tile at right angles to each other and straight with walls and conform to patterns selected or indicated.
- B. Obtain Architects and/or Owners approval of tile layouts for each area prior to installation, typical for all areas.
- C. Obtain exact locations of expansion joints and accessories before installing tile.
- D. Locate accessories in tile walls as indicated on Drawings or as directed by Architect. Where the size of accessory does not line up with the jointing pattern of adjacent tile, the cutting of tile and arrangement of joints around the accessories shall be as directed by Architect.

3.03 INSTALLATION

- A. Install tile backer board at wet walls and other locations where indicated and as follows:
 - 1. Install cement backer board and treat joints in accordance with ANSI A108.11, manufacturer's recommendations and TCNA Setting methods specified.
 - 2. Install glass-mat faced gypsum backing board in accordance with ASTM C840, manufacturer's recommendations, and TCNA Setting methods specified.

- B. Tile –General:
1. Install tile in accordance with ANSI Specifications A108.1 through A118.1 and Manufacturer's recommendations.
 2. Cut and drill neatly as required without marring tile. Rub smooth necessary cuts with a fine stone. Set cut edge against fixture, cabinet or other tile with joint at least 1/16-inch wide.
 3. Joint Widths: Install tile with joint widths indicated on Drawings, or as selected by Architect and/or Interior Designer for various tile types, sizes and applications.
- C. Pre-Manufactured Shower Curb: Comply with ANSI A108.13, TCNA Handbook, and the manufacturer's instructions for installation of curbs.
- D. Crack Isolation Membrane: Install waterproofing and crack isolation membrane over cracks and sawcuts up to 1/8 inch in width in concrete slab in accordance with Manufacturer's printed instructions. Sawcut joints over 1/8 inch shall be treated as control joints.
- E. Substrate Construction, Expansion, Control Joints, and Isolation Joints: Do not bridge joints which are designed to experience movement. Carry these types of joints through the mortar and tile installation materials.
1. Where waterproofing is specified, clean the joint and install open or closed cell backer rod to the proper depth as outlined in TCNA EJ171 Guidelines.
 2. Compress sealant as specified in Section 07 92 00 into the joint, coating the sides and leaving it flush with the surface.
 3. After the sealant is dry, place bond breaker tape over the joint.
 4. Apply waterproofing membrane over joint and substrate in accordance with manufacturer's printed instructions.
 5. Install tile onto the membrane, but do not bridge the joint.
 6. After tile is properly set, fill joint as specified herein under Tile Expansion and Control Joint Sealant article.
- F. Waterproofing Membrane: Install waterproofing and crack isolation membrane at all wet areas and as indicated on Drawings. Install in accordance with Manufacturer's printed instructions. Utilize where membrane is required beneath tile at floors or walls in wet areas. Waterproof coves at wet areas in accordance with Manufacturer's recommendations to a minimum height of 8 inches above floor. Allow membrane to cure before applying bonding materials.
- G. Mortar Bed Set: Where indicated to be thick-set, install tile using TCNA Method for substrate condition and type for mortar bed setting and substrate condition, and as follows:
1. Shower Receptors (Floor and Wall): TCNA B441 with epoxy grout.
- H. Thin Set: Where indicated to be thin-set, install tile using TCNA Method for substrate condition and type for latex-Portland cement mortar, and as follows:
1. Floors: TCNA F113 with epoxy grout at interior slab on grade construction. TCNA F125 with epoxy grout at concrete floors with cracks using crack isolation membrane.
 2. Wet Area Floors (Toilet Rooms): TCNA F122 using epoxy grout at wet area interior slab on grade construction. Use TCNA F125 at wet area floors with cracks using waterproofing and crack isolation membrane. Install epoxy grout in accordance with TCNA F115.

(continued)

3. Walls (dry): TCNA W243 with epoxy grout, typical dry area walls.
 4. Walls (wet): TCNA W244C or W245 (as appropriate to type of tile backer board used) with epoxy grout, with waterproofing membrane at wet area walls over tile backer board ("wet" or plumbing walls including showers, tubs and other wet walls).
- I. Grout:
1. Mix grout to a creamy consistency.
 2. Mix only as much grout as can be used in one hour.
 3. Thoroughly force into joints, fill entire depth.
 4. Finished surface of joints shall be uniformly smooth, and continuously level with edges of tile.
- J. Expansion and Control Joint Sealant:
1. Workmanship for caulking and sealants shall conform to requirements of Section 07 92 00.
 2. Provide expansion/control joints in accordance with TCNA EJ171 and where indicated on Drawings, and:
 - a. Interior: 20'-0" to 25'-0" in each direction, except provide joints at 8'-0" to 12'-0" in each direction at areas exposed to direct sunlight or moisture and at above ground concrete slab substrates.
 - b. Exterior: 8'-0" to 12'-0" in each direction.
 3. Joints between tile and door frames and other metal accessories, tile and ceiling, wall tile and wall tile at inside corners and wall tile and floor tile shall be sealed with silicone rubber sealant.
 4. Provide expansion joints at tile columns, curbs and pipes and fill with sealant. At building structural joints extend expansion joints through the tile. Seal with sealant. In no case shall tile be carried over expansion joints without a joint in the tile.
- K. Seal tile and grout in accordance with Manufacturer's recommendations.

3.04 CURING

- A. Damp cure all cement based tile installations, including Portland cement grouts, for 72 hours minimum.
1. Cover with clean non-staining 40-pound Kraft paper.
 2. Do not use polyethylene sheets directly over tile on horizontal surfaces.
 3. Keep all traffic off newly installed floors for at least 72 hours. Protection may be necessary.
- B. Cure epoxy based tile installations in accordance with recommendations of the epoxy mortar and grout manufacturer.

3.05 TOLERANCES

- A. Tile: Do not exceed the following deviations from level and plumb, and from elevations, locations, slopes and alignments shown:
1. Horizontal surfaces: 1/8 inch in 10'-0" in all directions;
 2. Vertical surfaces: 1/8 inch in 8'-0" in all directions.
 3. Lippage: 1/8 inch maximum.
 4. Maximum Variation of Joint Width: 1/16 inch at tile with joints up to 1/4 inch in width, 1/8 inch at tile with joints over 1/4 inch in width.

3.06 CLEANING

- A. Wipe surfaces clean after grouting, remove traces of mortar and grout. Do not use acid solution for cleaning glazed tile.
- B. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

3.07 PROTECTION

- A. Close spaces to traffic or other Work until tile is firmly set. Protect from damage until acceptance. Repair damaged Work at no additional cost to Owner.
- B. Prohibit foot and wheel traffic from using newly tiled floors for at least 7 days. Place large, flat boards in walkways and wheelways where use of newly tiled floor is unavoidable.

END OF SECTION

SECTION 09 51 00

ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes acoustical ceiling panels and suspension systems.

1.02 SUBMITTALS

- A. Shop Drawings: Submit Drawings showing complete layout of systems including attachments, intersections of members and edge conditions.
- B. Product Data: Provide data on metal grid system components and each acoustical panel, including manufacturer's certificate that products meet or exceed specified requirements.
- C. Samples:
 - 1. Submit 2 samples of each type of unit specified, minimum of 6 inches x 6 inches, including color selection when applicable.
 - 2. Submit samples of Manufacturer's full color selection for selection by Architect.

1.03 QUALITY ASSURANCE

- A. Qualifications: Installer shall be approved by Manufacturer of material or system.
- B. Standards: Comply with the following:
 - 1. ASTM C635, "Standard Specification for Acoustical Tile and Lay-In Panel Ceilings."
 - 2. ASTM C636, "Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels."
 - 3. ASTM E580, "Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions."
 - 4. Ceilings and Interior Systems Construction Association (CISCA) "Recommendations for Direct-Hung Acoustical tile and Lay-in Panel Ceilings."
 - 5. CISCA's Guidelines for Systems Requiring Seismic Restraint: Comply with CISCA's "Guidelines for Seismic Restraint of Direct-Hung Suspended Ceiling Assemblies--Seismic Zones 0-2."
 - 6. ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."
- C. Surface Burning Characteristics: Class A per ASTM E1264 and Fed. Spec. SS-S-118B, Flame Spread 25 or under, per ASTM E-84 (UL Label).
- D. Provide acoustical ceiling system which has been manufactured, fabricated and installed to provide Noise Reduction Coefficient (NRC) ratings as specified.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact. Protect finished surfaces with removable wrapping or coating which will not bond when exposed to sunlight.

- B. Storage: Adequately protect against damage while stored at the site.
- C. Handling: Comply with Manufacturer's instructions.

1.05 PROJECT/SITE CONDITIONS

- A. Environmental Requirements:
 - 1. Do not install ceiling panels until building is closed in and HVAC system has been in operation for a minimum of 48 hours with ambient temperature and humidity conditions maintained at the levels indicated for the Project when occupied for its intended use.
 - 2. Locate materials onsite, in areas where units will be installed, at least 24 hours before beginning installation to allow materials to reach temperature and moisture content equilibrium.

1.06 MAINTENANCE

- A. Extra Materials: Provide an additional two (2) boxes of each type of acoustical unit installed, in unopened labeled cartons, to the Owner at completion of Work, for his maintenance use, at no additional cost. Provide, at minimum, one full carton of each type of acoustical unit.

1.07 WARRANTY

- A. Provide manufacturer's standard warranties agreeing to repair or replace acoustical panels and suspension systems that fail within the warranty period. Failures include manufacturing defect, sagging and warping of acoustical panels, and rusting of grid system.
 - a. Warranty Period:
 - 1. Acoustical Panels: Manufacturer's standard maximum warranty for each type of panel used.
 - 2. Grid and Suspension System: Manufacturer's standard maximum warranty, but not less than 10 years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of the following Manufacturers, except as approved otherwise by the Architect, subject to compliance with Specification requirements.
 - 1. Armstrong World Industries www.ceilings.com
 - 2. Chicago Metallic Corporation (for suspension system) www.chicago-metallic.com
 - 3. USG Interiors, Inc. www.usg.com
 - 4. Certainteed Corporation Ceiling Products www.certainteed.com

2.02 SUSPENSION SYSTEM

- A. Ceiling Suspension System: Intermediate Duty or Heavy Duty, as required by type of panel, with components formed from commercial quality cold rolled steel electro-zinc coated.
 - 1. Main-Runners: Minimum of 1-1/2 inch in height with an exposed capped face of 15/16 inch in width, unless otherwise indicated on Drawings, nominally 12 feet long.
 - 2. Cross-Tees: Minimum of 1-1/4 inches or 1-1/2 inches in height with an exposed capped face in a width and profile to match main runners.

3. Finish: Exposed faces of main and cross runners shall be a baked enamel paint finish, Colors as follows:
 - a. White, unless otherwise indicated on Drawings.
- B. Hanger Wire: Galvanized steel conforming to Federal Specification FF-QQ-W-461, Finish 5, Class 1 annealed, and not less than 12 gauge).
- C. Suspension system shall support the ceiling system specified with a maximum deflection of 1/360 of the span.
- D. Wall and Penetration Moldings: 24 MSG painted steel with a minimum one inch wide lower flange, finish and configuration to match grid. For circular penetrations and/or curved walls/soffits provide edge molding manufactured to exact diameter of circular penetration or flexible vinyl edge trim capable of curving to exact diameter of wall or penetration without distortion.
- E. Seismic Stabilizer Bars, Struts and Clips: Manufacturer's standard perimeter stabilizers, compression struts, and seismic clips designed to accommodate seismic forces and as required by installation standards.
- F. Hold-Down Clips: Provide access type hold-down clips where required by Acoustical Ceiling Manufacturer for type and condition and where panels weigh less than one pound per square foot.

2.03 CEILING PANELS

- A. Acoustical Ceiling Panels:
 1. Model/Style: "Cortega #704" as manufactured by Armstrong, or equivalent as selected by the Architect.
 2. Size: 24 inch x 24 inch x 5/8 inch.
 3. Surface Finish: Factory applied, washable, vinyl latex paint finish, white color.
 4. Light Reflectance (LR): .82. per ASTM E1264.
 5. NRC: 0.55 in suspended mounting.
 6. CAC: 33 (continuous ceiling).
 7. Edge Detail: Tegular edge.
 8. Grid Type: Armstrong Prelude or Prelude XL.

2.04 ACCESSORIES

- A. Acoustical Batt Insulation: As indicated on Drawings and as specified in Section 09 81 00.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing, with a copy to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Verify, before proceeding with this Work, that required inspections of existing conditions have been completed.

3.02 INSTALLATION - SUSPENSION SYSTEM

- A. Install suspension system in accordance the following:
 - 1. ASTM C635, ASTM C636 and as supplemented in this Section.
 - 2. ASTM E580, "Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions."
 - 3. CISCA's Recommendations for Acoustical Ceilings: Comply with CISCA's "Recommendations for Direct-Hung Acoustical tile and Lay-in Panel Ceilings (zones 0-2).
 - 4. ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."
 - 5. 2006 IBC Chapter 8 and Chapter 16 requirements for suspended ceilings for Seismic Design Category indicated in General Structural Notes on Drawings for location where project is located.
- B. Install system capable of supporting imposed loads to a deflection of 1/360 maximum. Individual component deflection shall not exceed 1/360 of span.
- C. Locate system on room axis according to reflected ceiling plan. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less-than-half width units at borders.
- D. Install after major above-ceiling Work is complete. Coordinate the location of hangers with other Work.
- E. Provide hanger clips during steel deck erection. Provide additional hangers and inserts as required.
- F. Hanger Wire Installation: Secure hanger wires to upper structural elements above. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for the supporting structural member, and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures. Tie wires with a minimum of three tight turns and space hangers so that each hanger wire supports a maximum of 16 sq. ft. Lay-out as reflected and dimensioned in reflected ceiling plan.
- G. Laterally brace and seismic stabilizer bars, struts and clips as required to comply with Seismic design requirements.
- H. Hang suspension system independent of walls, columns, ducts, pipes, conduit, and other obstructions. Where required, provide additional suspended structural members to form "trapeze" to span underside of ductwork or other obstruction, with main suspension of ceiling system suspended from the additional members.
 - 1. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
- I. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- J. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability. Support fixture loads by supplementary hangers located within 6 inches of each corner; or support components independently.
- K. Do not eccentrically load system, or produce rotation of runners.

- L. Install edge molding at intersection of ceiling and vertical surfaces, using longest practical lengths. Miter corners. Provide edge moldings at junctions with other interruptions. Fit border trim neatly against abutting surfaces.
- M. Form expansion joints as detailed. Form to accommodate plus or minus 1 inch movement. Maintain visual closure.
- N. Install protection over light fixtures in accordance with UL assembly requirements, where required.

3.03 INSTALLATION - ACOUSTICAL LAY-IN UNITS

- A. Material shall be dry and clean at time of application.
- B. Install acoustical units in accordance with Manufacturer's instructions, and as specified herein.
- C. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
- D. Lay directional patterned units one way with pattern parallel to longest room axis. Fit border trim neatly against abutting surfaces. Where recommended by Manufacturer, use tiles one at a time from at least four open boxes to avoid creating any pattern due to slight variations from box to box.
- E. Install units after above-ceiling Work is complete.
- F. Install acoustical units level in uniform plane, and free from twist, warp and dents.
- G. Cut panels to fit irregular grid and perimeter edge trim. Field rabbett panel edge. Double cut and field paint exposed edges of reveal edge units.
- H. Where round obstructions occur, provide preformed closers to match edge molding.
- I. Field paint cut edges to match surface color and sheen.

3.04 ERECTION TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

3.05 ADJUSTING

- A. Remove damaged or soiled panels and replace with new units, as directed by Architect.
- B. 'Touch-up' minor abraded surfaces.

3.06 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 09 64 66

WOOD ATHLETIC FLOORING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Hardwood gymnasium flooring as shown on Drawings and as specified herein.
 - 2. Preparation of existing concrete floors as necessary for installation of new wood athletic flooring.

1.02 SYSTEM DESCRIPTION

- A. MFMA (Maple Flooring Manufacturer's Association) recognized maple athletic system with 1 inch x 6 inch basket weave sub-floor on 25 degree angle to allow for expansion and contraction of the sub-floor and which also allows continuous airflow underneath the floor.
- B. Concrete Slab Depression – Depression is 2-3/8 inches for 25/32 inch maple.
- C. Hardwood Flooring Contractor shall provide all labor, materials, tools and services to furnish, deliver and install a complete wood floor system from the vapor barrier through the sanding and finishing with game lines as shown on drawings, plus the installation of perimeter base moldings and thresholds.
- D. Hardwood Flooring Contractor shall grind and fill existing concrete slab and level to a tolerance of 1/8 inch on a 10'-0" straight edge. Slab shall exhibit 4.5 pounds or less of vapor emission as tested by the calcium chloride method and 80 percent or less relative humidity when tested by the RH method prior to installation.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's "system-named" specifications, product data and installation instructions.
- B. Shop Drawings: Submit drawings showing layout, dimensions and construction details.
- C. Samples: Submit sample of specified system if requested by Architect.
- D. Maintenance Literature: Submit manufacturer's maintenance recommendations.
- E. Warranty: Submit copy of manufacturer's standard warranty and finish warranty.

1.04 QUALITY ASSURANCE

- A. System shall not incorporate plywood or oriented strand board nor be fixed to the substrate.
- B. Installer Qualifications: The Flooring Contractor shall be a firm experienced in the maple-flooring field and approved and certified by the manufacturer. Installer shall be MFMA certified and shall have completed a minimum of 5 successful installations in the last three years of similar scope.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Materials should not be delivered, stored or installed until all masonry, painting, plastering, tile, marble and terrazzo work are completed and/or until all overhead work (including the installation of mechanical work, lighting, backstops, scoreboards, etc.) has been finished.
- B. Packing and Shipping: Deliver materials to site in manufacturer's original unopened packaging with labels intact.
- C. Storage: Adequately protect against damage while stored at the site.
- D. Handling: Comply with manufacturer's instructions.

1.06 PROJECT/SITE CONDITIONS

- A. Environmental Requirements: Building shall be enclosed and weather-tight. Permanent HVAC shall be installed and operating during and after installation. A temperature range of 55 deg to 78 deg F. and a relative humidity of between 35 percent and 50 percent should be maintained.

1.07 WARRANTY

- A. Standard warranty: The flooring manufacturer shall warrant the flooring materials to be free from manufacturing defects for a period of one year from the date of substantial completion. The flooring installation contractor shall warrant the installation to be free from defects for the same period.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the following manufacturers, except as otherwise approved by the Architect, subject to compliance with specifications requirements:
 - 1. Aacer Flooring, LLC www.aacerflooring.com
 - 2. As approved by Architect.

2.02 SYSTEM DESCRIPTION

- A. Basis of Design: Aacer Scissor Loc II system as manufactured by Aacer Flooring, LLC.

2.03 FLOOR REPAIR/FILL MATERIALS

- A. As specified in Section 03 30 00 – Cast-In-Place Concrete.

2.04 MATERIALS

- A. Moisture Protection:
 - 1. Vapor-proofing shall consist of 1/4 inch multi-cellular, linear linked, closed cell polyethylene foam, (super foam), density PCF 2.0 nominal.
 - 2. 6 mil polyethylene vapor barrier under super foam.
- B. Sub-floor: Sub-floor shall be kiln dried 1 inch x 6 inch Gym Grade #2 (SPF), Spruce, Pine, or Fir supplied by hardwood flooring manufacturer.

- C. Flooring: Domestic Manufacture, Mixed Grain TGEM KD RL Northern Hard Maple, MFMA Graded and Trade Marked, 25/32 inch x 2-1/4 inches Second or Better Grade.
- D. Fasteners – Shall be 2 inch barbed cleats or 2 inch staples.
- E. Expansion Voids:
 - 1. Wall base shall be 4 inch x 3 inch Heavy Duty Molded, vented, rubber cove base, with pre-molded outside corners and mitered inside corners.
 - 2. Aluminum thresholds shall be 3/16 inch x 6 inch beveled both sides, Mill finish.
- F. Finish – Shall be MFMA approved oil modified polyurethane gym seal and finish compatible with local emissions requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Inspect concrete subfloors for proper tolerance and dryness and report any discrepancies to the General Contractor in writing.

3.02 PREPARATION

- A. Do not install flooring on surfaces that are not suitable for proper installation. Before beginning work under this section, correct defects such as rough or scaling concrete, low spots, high spots, uneven surfaces, and repair damaged portions of concrete slabs utilizing concrete repair and fill products specified in Section 03 30 00 as necessary. Concrete slabs shall be given a leveling course of latex fill and the surface shall not vary more than 1/8 inch when measured with a 10 foot straightedge placed in any direction.
- B. Sweep and clean concrete floor of all debris and foreign matter. Ensure that slab is dry and clean. Remove paint spots, plaster, masonry droppings, grease, dirt, and other foreign matter including chemical curing agents which may affect the bond of adhesive-applied wood flooring systems. Concrete shall be fully cured and dry.

3.03 INSTALLATION

- A. Install 6 mil vapor barrier over entire concrete slab, lap joints 6 inches, seal with duct tape, and roll up walls 2 inches.
- B. Cover entire concrete slab 1/4 inch closed cell foam, seal with duct tape.
- C. Install first layer of 1 inch x 6 inch sub-floor diagonally to the long dimension of the room at a 25 degree angle. The ends of the 1 inch x 6 inch shall be butted and side spaced approximately 6 inches between adjoining 1 inch x 6 inch. Provide 2 inch expansion voids at the perimeter and all vertical obstructions.
- D. The second layer of 1 inch x 6 inch shall be laid in the opposite direction to the first layer but also at a 25 degree angle to the long dimension of the room so that no end joints will fall over an end joint of the first layer. The ends of the second layer shall be butted and side spaced approximately 2 inches between adjoining 1 inch x 6 inch and secured to the first layer with nails or staples at each intersection. Provide 2 inch expansion at all walls and permanent obstructions. A single 1 inch x 6 inch border strip shall be installed as part of the second layer of sub-flooring the perimeter of the floor.

- E. Install flooring parallel with the main playing court by power nailing or stapling approximately 12 inches on center.
 - 1. Size joints between flooring strips to allow for intermediate expansion in accordance with local humidity conditions.
 - 2. Provide 2 inch expansion voids at the perimeter and all vertical obstructions.

3.04 FLOOR SANDING

- A. Machine sand with coarse, medium and fine paper to provide a smooth, even and uniform surface.
- B. Remove all sanding dust from the entire surface by tack or vacuum.

3.05 FINISHING

- A. After removing all sanding dust from the surface and cracks of the floor, inspect the entire area of the floor to insure that the surface is acceptable for finishing and completely free from sanding dust and free of drum stop marks, gouges, streaks and shiners.
- B. Apply two coats of MFMA approved gym sealer and two coats of MFMA approved gym finish. Buff and clean the floor between each coat. Paint the game lines as shown on the drawings between the seal and the first coat of finish. The paint for the game lines shall be compatible with the finish.

3.06 BASE AND THRESHOLD INSTALLATION

- A. Affix vent cove base to the wall with the recommended adhesive. Use pre-molded outside corners and neatly mitered inside corners.
- B. Install aluminum thresholds as required, anchoring firmly in the concrete floor beyond the limits of the wood flooring.

3.07 CLEANING

- A. During the course of the Work and on completion of the Work, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

3.08 INSTRUCTION AND MAINTENANCE

- A. Upon completion of the floor installation, instruct Owner, attendants or individuals in charge and responsible for the upkeep of the building in proper care and maintenance of wood flooring system, including ventilation with natural or mechanical air circulation at all times (heat, if necessary, during high humidity periods). Mechanical equipment shall maintain temperature and humidity ranges spelled out in the working conditions.

END OF SECTION

SECTION 09 65 16

RESILIENT SHEET FLOORING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes slip resistant sheet vinyl safety flooring and accessories.

1.02 SUBMITTALS

- A. Shop Drawings: Submit shop drawings to indicate materials, details, and accessories, including cut diagram indicating seam locations and roll direction. Use mitered seam layouts for corners when changing directions 180 degrees, unless approved otherwise or otherwise indicated on Drawings.
- B. Product Data: Submit data on specific products, describing physical and performance characteristics, installation instructions, and field reports.
- C. Samples: Submit 2 samples, 12 inches x 12 inches, of each material specified illustrating color and pattern.

1.03 QUALITY ASSURANCE

- A. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.
 - 1. Training: Installer who has attended manufacturer's flooring installation training clinic.
- B. Regulatory Requirements:
 - 1. Critical Radiant Flux Classification: Class I (Not less than 0.45 Watts per sq./cm per ASTM E648).
- C. Static Coefficient of Friction: Finished resilient tile flooring shall have a tested coefficient of friction of 0.6 minimum wet or dry for level surfaces and treads of stairs and 0.8 minimum wet or dry for ramp surfaces when tested in accordance with ASTM D2047 / UL410.
- D. Pre-installation Meeting: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions, manufacturer's warranty requirements, and installer qualifications.

1.04 PROJECT/SITE CONDITIONS

- A. Temperature Requirements: If storage temperature is below 68F the resilient sheet flooring product must be moved to a warmer place and allowed to reach this temperature before unrolling or installation. The room temperature must not be below 68 degrees F and the floor temperature 65 degrees F. For further information, refer to current Installation Guide.
- B. Maintain air temperature and structural base temperature at flooring installation area between 68 degrees F and 80 degrees F for 72 hours before, during and 24 hours after installation.

- C. Floor Coverings and adhesives should not be installed anytime the air temperature/concrete surface is within +/- 5 degrees F of the dew point.

1.05 WARRANTY

- A. Manufacturer's Warranty: Submit manufacturer's standard warranty covering defects in material and workmanship for a period of ten (10) years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Slip Resistant Sheet Vinyl Flooring: Furnish products of the following Manufacturer, except as approved by the Architect, subject to compliance with Specification requirements.
 - 1. Altro USA www.altro.com

2.02 SLIP RESISTANT SHEET VINYL FLOORING

- A. Slip Resistant Sheet Vinyl Flooring: Altro Walkway 20 (measurements and product weights given below are approximate): Slip Resistance .85.
 - 1. Thickness: 0.08."
 - 2. Roll Width: 6' 7"
 - 3. Roll Length: 66 feet.
 - 4. Roll Weight: 4.8lbs per sq. yd.
 - 5. Color: VM20907, Biscuit.

2.03 ACCESSORIES

- A. Vinyl welding rod: Altro weld rod.
- B. Cove former: Acceptable material, sized to suit application:
 - 1. Altro Cove former 20R - 24 mm (1 inch) radius.
- C. Gulley edge: Acceptable material, vinyl, sized to suit application:
 - 1. Altro Gulley Edge GE as selected by Architect to suit application.
- D. Cap strip: Acceptable material, sized to suit application, Vinyl:
 - 1. Altro Cap Strip as selected by Architect to suit application.
- E. Joint cover strip: Acceptable material, vinyl, sized to suit application:
 - 1. Altro Joint Cover Strip as selected by Architect to suit application.
- F. Acrylic Adhesive: For dry areas with no spillage, Ecofix 20, a one-part, water-based, acrylic adhesive as recommended by manufacturer.
- G. Polyurethane Adhesive: For areas that have drains or subjected to excess spillage of water, extreme temperature changes or extreme heavy rolling loads, use Spray Lock 3100 High Moisture Spray Lock Adhesive.
- H. Subfloor Filler and Leveler: Use only gray Portland cement-based underlayments, and patching compounds. Use for filling cracks, holes or leveling. White gypsum materials are not acceptable. When patching areas that may be subjected to moisture a moisture tolerant patching material must be used.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog, installation instructions.
- C. Site Verification of Conditions: Verify substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions. Verify concrete floors are dry and bondable.

3.02 PREPARATION

- A. Safety flooring shall be installed over subfloors conforming to ACI guide 302.2R and prepared per ASTM F710, for concrete floors.
- B. Conduct moisture tests per ASTM F-2170 on all concrete slabs regardless of age or grade level. ASTM F-2170 Internal Relative Humidity (IRH) test results must not exceed 85 percent.
- C. Do not proceed with work until results of moisture condition tests are acceptable.
- D. Apply subfloor filler to low spots and cracks to achieve flatness to a tolerance of 3/16 inch over 10 feet (and/or per architect's specifications for slope and pitch), allow to cure.
- E. Remove dust, old adhesive, paint, dirt, wax, sealer, crayon and all construction marking pen and paint markings, and all foreign matter from existing surfaces, remove ridges and bumps.

3.03 INSTALLATION - SHEET FLOORING

- A. Install in accordance with Manufacturers' instructions and in accordance with "Recommended Work Procedures for Resilient Floor Coverings" of the Resilient Floor Covering Institute.
- B. Walkway 20 Installation: Install Altro safety flooring in accordance with the current posted Altro Installation Practices and Quick Facts Guide. All Seams shall be heat welded with Altro Weldrod™ only. Failure to install Altro safety flooring in accordance with recommended procedures will void the Altro Limited Product Warranty.
- C. Coved Installation: Where Altro safety flooring is coved up wall surfaces and other abutments, installation shall be in accordance with Altro safety flooring Installation Practices using the following accessories:
 - 1. At standard wall finishes: Use Altro C7 vinyl cap strip to accommodate sheet vinyl to a height as indicated; adhere with contact tape.
 - 2. At 0.75 inch radius coving at juncture of vertical and horizontal surfaces: Use Altro Vinyl Cove Former 20R: install with contact tape.
 - 3. Top set cove base: Install in accordance with manufacturer's instructions.

3.04 CLEANING

- A. Cleaning: Remove temporary coverings and protection of adjacent work areas.
 - 1. Repair or replace damaged installed products.
 - 2. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance.
- B. Sweep or vacuum all construction debris and dust first, then clean the flooring with Altro Clean 44 using an auto scrubber.
- C. During the course of the Work and on completion, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition.

3.05 PROTECTION

- A. Cover and protect finished installation from damage from other trades using a suitable non-staining protective covering without taping to the surface of the flooring.

END OF SECTION

SECTION 09 65 19

RESILIENT TILE FLOORING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Resilient stair treads.
 - 2. Resilient base.
 - 3. Installation accessories, adhesives and other related installation materials as necessary.

1.02 SUBMITTALS

- A. Product Data: Submit data on specific products, describing physical and performance characteristics, sizes, patterns and colors available.
- B. Samples: Submit 2 samples of each material specified illustrating color and pattern.
- C. Maintenance Data: Submit maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.03 QUALITY ASSURANCE

- A. Qualifications: Installation shall be by qualified installer approved by the Manufacturer of the materials.
- B. Regulatory Requirements:
 - 1. Critical Radiant Flux Classification: Class I (Not less than 0.45 Watts per sq./cm per ASTM E648).
 - 2. IBC Section 804 and DOC FF-1 "pill test" (CPSC 16 CFR 1630).
 - 3. Nosing design shall be in accordance with applicable law.
- C. Static Coefficient of Friction: Finished resilient tile flooring shall have a tested coefficient of friction of 0.71 minimum dry, 0.6 minimum wet for level surfaces and treads of stairs and 0.8 minimum wet or dry for ramp surfaces when tested in accordance with ASTM D2047 / UL410.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.
- B. Storage: Adequately protect against damage while stored at the site.
- C. Handling: Comply with Manufacturer's instructions.

1.05 PROJECT/SITE CONDITIONS

- A. Environmental Requirements: Installation shall not begin until Work of other Trades is substantially completed and the area or rooms where flooring is to be installed has been maintained at a minimum temperature of 70 degrees F. for at least 48 hours.

- B. Moisture content and bondability of concrete sub-floors shall be determined by a field testing method recommended by the flooring manufacturer.
- C. Maintain ambient temperature required by Adhesive Manufacturer three days prior to, during, and 24 hours after installation of materials.

1.06 MAINTENANCE

- A. Extra Materials: Provide extra maintenance materials equal to 2 percent of total installed of each type, color and pattern, but not less than one carton of each.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Wall Base and Flooring Accessories: Furnish products of the following Manufacturer, except as otherwise approved by the Architect, subject to compliance with Specification requirements.
 - 1. Flexco Corporation www.flexcofloors.com
- B. Stair Treads and Risers: Furnish products of the following Manufacturer, except as otherwise approved by the Architect, subject to compliance with Specification requirements.
 - 1. Flexco Corporation www.flexcofloors.com

2.02 BASE

- A. Base: ASTM F1861.
 - 1. Material: Type TV thermoplastic vinyl.
 - 2. Height: 4 inches, unless otherwise scheduled on Drawings.
 - 3. Thickness: 1/8 inch thick
 - 4. Length: Coils/Rolls in manufacturer's standard lengths. Cut lengths are not acceptable.
 - 5. Type: Top set, coved typical.
 - 6. Color: No. WF-01, Black Dahlia.
- B. Base Accessories: Premolded end stops of same material, size, and color as base.

2.03 STAIR COVERING

- A. Stair Treads: ASTM F2169 Composition A, Rubber or Composition B, Vinyl as indicated on Drawings or as selected by Architect.
 - 1. Size: Full width and depth of stair tread in one piece.
 - 2. Pattern: Raised disc pattern as selected by Architect.
 - 3. Color: As scheduled on Drawings, or if not indicated, as selected by Architect from Manufacturer's full range of colors and patterns.
- B. Stair Risers:
 - 1. Material: Matching treads.
 - 2. Thickness: 1/8 inch thick
 - 3. Size: Maintain height and length in one piece.

2.04 BASE

- A. Base: ASTM F1861.
 - 1. Material: Type TP thermoplastic rubber.
 - 2. Height: 4 inches, unless otherwise scheduled on Drawings.
 - 3. Thickness: 1/8 inch thick
 - 4. Length: Coils/Rolls in manufacturer's standard lengths. Cut lengths are not acceptable.
 - 5. Type: Top set, coved typical, toeless at carpet.
 - 3. Design and Color: As scheduled on Drawings, or if not indicated, as selected by Architect from Manufacturer's full range of colors and patterns.
- B. Base Accessories: Premolded end stops and external corners of same material, size, and color as base.

2.05 ACCESSORIES

- A. Adhesives: Suitable for the underfloor substrate conditions involved as recommended by the Manufacturer of the flooring materials. Adhesives shall be waterproof, stabilized type. Asphalt emulsions are not acceptable.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Inspect the sub-floor to receive resilient flooring in accordance with ASTM F710. Do not lay floor covering until sub-floors are in proper condition to receive same. Sub-floors shall be broom clean, free of foreign matter and thoroughly clean before installation.
- C. Verify concrete floors are dry and bondable.

3.02 PREPARATION

- A. Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with subfloor filler.
- B. Apply, trowel, and float filler to leave a smooth, flat, hard surface.
- C. Prohibit traffic from area until filler is cured.
- D. Vacuum clean substrate.
- E. Apply primer to floor surfaces as recommended by Flooring Manufacturer.

3.03 INSTALLATION - BASE

- A. Fit joints tight and vertical. Maintain minimum measurement of 18 inches between joints.
- B. Miter internal corners. At external corners, use premolded units. At exposed ends use premolded units.

- C. Install base on solid backing. Bond tight to wall and floor surfaces.
- D. Scribe and fit to door frames and other interruptions.

3.04 INSTALLATION - STAIR COVERING

- A. Install stair treads and risers one piece for full width and depth of tread.
- B. Adhere over entire surface. Fit accurately and securely.

3.05 CLEANING

- A. After flooring has become well seated, minimum 72 hours, and just prior to opening it to traffic, thoroughly clean in accordance with Manufacturer's recommendations.
 - 1. Apply two coats of manufacturer's recommended wax to cleaned resilient flooring in accordance with manufacturer's published recommendations.
- B. Remove dirt, debris and adhesive from floor covering and adjacent surfaces using Manufacturers recommended methods and leave installation in a clean, undamaged condition.
- C. During the course of the Work and on completion, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition.

3.06 PROTECTION

- A. Minimize traffic until flooring has become well seated, at least 72 hours, at a maintained temperature of not less than 70 degrees F., and do not permit fixtures, equipment, trucks, or similar items on flooring.
 - 1. Provide temporary protection materials of underlayment board or other suitable protection sheets over flooring where it is necessary to move heavy or sharp loads across the floor within 72 hours after installation.
 - 2. Protect installed flooring by providing protective coverings or other protection as recommended by manufacturer until time of final completion of Project.

END OF SECTION

SECTION 09 65 66

RESILIENT RUBBER ATHLETIC FLOORING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Resilient rubber athletic flooring.

1.02 SUBMITTALS

- A. Product Data: Submit manufacturer's specifications and installation instructions.
- B. Samples: Submit samples showing selected colors for verification purposes.
- C. Seam Diagram: Submit proposed seaming diagram for approval prior to installation.
- D. Maintenance Literature: Submit manufacturer's Care & Maintenance Guide for each flooring type.

1.03 QUALITY ASSURANCE

- A. Installer Qualifications: Installer shall have a minimum of five (5) years experience in the field installing indoor resilient multipurpose surfacing and have worked on at least five (5) projects of similar size, type and complexity.
- B. Certifications: Installer to submit the indoor resilient athletic surfacing manufacturer's or distributor's certification attesting that they are an approved installer of the indoor resilient multipurpose surfacing.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in manufacturer's original unopened packaging with labels intact. Protect finished surfaces with removable wrapping or coating which will not bond when exposed to sunlight. Material shall not be delivered until all related work is in place and finished and/or proper storage facilities and conditions can be provided and guaranteed stable according to Fieldturf USA Sports' recommendations.
- B. Storage: Adequately protect against damage while stored at the site. Store the material in a secure, clean and dry location. Maintain temperature between 55 deg. and 85 deg. F. Store the indoor resilient athletic surfacing on a clean flat surface. Do not stack rolls.
- C. Handling: Comply with manufacturer's instructions.

1.05 PROJECT/SITE CONDITIONS

- A. Project/Site Conditions:
 - 1. Contractor shall maintain project/site conditions acceptable for the installation of the indoor resilient multipurpose flooring.
 - 2. Area in which the indoor resilient multipurpose surfacing will be installed shall be dry and weather tight. Permanent heat, light and ventilation shall be installed and operable.

3. All other trades shall have completed their work prior to the installation of the resilient athletic flooring. Contractor shall maintain a secure and clean working environment before, during and after the installation. Suspension of other trades' work may be authorized providing their work will not damage the new flooring.
4. Maintain a stable room temperature of at least 65 deg. F for a minimum of one (1) week prior to, during and thereafter installation.
5. An effective low-permeance vapor barrier is placed directly beneath the concrete subfloor. For "on" or "below grade" installations, it is recommended to provide a permanent vapor barrier resistant to long term hydrostatic pressure/moisture exposure. Protrusions should be sealed to prevent moisture migration into the slab. Moisture should not be allowed to enter the slab after the completed construction.
6. Concrete subfloor surface pH level within the 7 to 9 range dependent upon installation type.
7. Concrete subfloor should be no greater than 1/8 inch within a 10 ft diameter. This tolerance can be measured in accordance with ASTM E1155. A specified (FF) of 50 and an (FL) of 30 should reach this degree of floor flatness and floor level. There is no numerical correlation between F numbers and the deviation from the straight edge, however the above specified numbers should achieve a flat floor with minimal deviation in the slab. Reference ACI 117 and ACI 302.1R. Contractor should provide a certificate of compliance with the above recommendations.
8. Concrete subfloor must be clean and free of all foreign materials or objects including, but not limited to, curing compounds and sealers.
9. Fill cracks, grooves, voids, depressions, and other minor imperfections with Ardex (or equal) cement-based patching/leveling compounds. As specified in Section 03 30 00. Follow the manufacturer's directions. Moveable joints must be treated utilizing specific transitioning joint devices depending upon the architect's recommendations. Follow current ASTM F710 guidelines for the preparation of concrete slabs to receive resilient flooring.
10. Refer to ACI 302.2R "Guidelines for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials" for concrete design and construction.
11. Concrete slab shall be fortified with continual steel reinforcement.

1.06 WARRANTY

- A. Materials: Resilient athletic surfacing shall be covered by the manufacturer against product defects for 3 years.
- B. Installation: Installation of resilient multipurpose surfacing shall be covered against poor workmanship and faulty installation by a two (2) year written, limited warranty provided by the contractor performing/overseeing the installation.

1.07 ADDITIONAL MATERIALS

- A. Furnish to the owner additional materials containing a total of at least 5 percent of each different color or design of the resilient athletic surfacing used on the project.

PART 2 PRODUCTS

2.02 MANUFACTURER

- A. Furnish products of the following Manufacturer, except as approved otherwise by the Architect, subject to compliance with Specification requirements:
 - 1. Tarkett Sports; Fieldturf USA Sports www.tarkettsportsindoor.com
 - 2. As approved by the Architect
- B. Basis of Design: Drawings and Specifications are based on Dropzone Speckle as provided by Fieldturf USA Sports; Tarkett Sports.
 - 1. All other installation accessories and related components must be either made or approved by the indoor resilient athletic surfacing manufacturer.

2.02 MATERIAL

- A. Resilient Rubber Flooring: Dropzone Speckle 8mm recycled non-laminated rubber flooring.
 - 1. Physical properties of the indoor resilient athletic surfacing shall conform to the following minimums:
 - a. Roll Width: 4ft.
 - b. Length: As required, refer to Drawings.
 - c. Total Thickness: 8 mm.
 - d. Weight: 1.92 lbs/sq. ft.
 - e. Tensile Strength: 200 minimum (ASTM D412)
 - f. Static Load: 1000 p.s.i (ASTM F970modified test)
 - g. Coefficient of Friction: Greater than .9 (ASTM 2047)
 - h. Chemical Resistance: Excellent (ASTM F925)
 - i. Ambient Noise Reduction: .10 (ASTM C423)
 - j. Impact Sound Insulation: .45 minimum (ASTM E492)
 - k. Thermal Conductivity: Approximate .406 (ASTM C518)
 - l. Sound Transmission: .45 minimum (ASTM 413)
 - 2. Colors:
 - a. Trainer Area: Goldmine DZ36.
 - b. Weight Room: Deep Ocean DZ45.
 - 3. Adhesive: As approved by the indoor resilient athletic surfacing manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
 - 1. Verify area in which the indoor resilient athletic surfacing will be installed is dry and weather tight. Verify that permanent heat, light and ventilation is installed and operable.
 - 2. Verify that all other work that could cause damage, dirt and dust or interrupt the normal pace of the indoor resilient athletic flooring installation is completed or suspended.
 - 3. Verify that there is a stable room temperature of at least 65 deg. F.
 - 4. Verify that there are no foreign materials or objects on the subfloor and that the subfloor is clean and ready for installation.
 - 5. Direct Full Spread Adhering to Concrete Subfloor : moisture content less than 15 pounds/1,000 sq.ft./24 hours when tested using calcium chloride per ASTM

F1869 or no more than 92 percent RH when tested per ASTM F2170. Use only approved Multi-Poxy adhesive as supplied by manufacturer.

6. If both tests are performed, use the highest value. Do not average the results of the tests. Report all field test results in writing to Architect prior to installation.
7. Verify that the concrete subfloor surface pH level is within the 7 - 9 range.
8. Document the results indicating the slab is within manufacturer's tolerances for slab deviation.

- B. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this Work.

3.02 PREPARATION

A. Surface Preparation:

1. Sand the entire surface of the concrete slab.
2. Sweep the concrete slab so as to remove all dirt and dust. If a sweeping compound is to be used it must be a sweeping compound that does not contain oil or other items that may inhibit the adhesive bond.
3. Slab must be dust free. In the event that dust impairs adhesive bond, priming the slab prior to application of adhesive may be necessary. Follow installation guidelines.

3.03 INSTALLATION

- A. Installation area shall be closed to all traffic and activity for a period to be set by the resilient athletic surfacing installer. Resilient athletic surfacing installation shall not begin until the installer is familiar with the existing conditions.
- B. All necessary precautions should be taken to minimize noise, smell, dust, the use of hazardous materials and any other items that may inconvenience others.
- C. Install the resilient athletic surfacing in strict accordance with the resilient athletic surfacing manufacturer's written instructions.
- D. Install the resilient athletic surfacing minimizing cross seams, and in accordance with approved seaming diagram.
- E. Install appropriate threshold plates or transition strips where necessary.

3.04 CLEANING

- A. Remove all unused materials, tools, and equipment and dispose of any debris properly. Clean the indoor resilient athletic surfacing in accordance with the manufacturer's instructions.
- B. During the course of the Work and on completion of the Work, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

3.05 PROTECTION

- A. If required, protect the indoor resilient athletic surfacing from damage using coverings approved by the manufacturer until Final Project Completion.

END OF SECTION

SECTION 09 67 23
RESINOUS FLOORING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Include: Seamless epoxy resinous flooring system with broadcast aggregate.

1.02 SUBMITTALS

- A. Product Data: Submit manufacturer's product data, including physical properties and colors available.
- B. Samples: Submit Manufacturer's samples showing selected color texture. These samples shall serve as a basis for comparison through the duration of the Work.
- C. Maintenance Instructions: Submit manufacturer's maintenance instructions, including maintenance procedures and materials, procedures for stain removal and surface repair, and recommended schedule for cleaning.

1.03 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Applicator: Use applicator experienced in application of specified materials for a minimum of Five (5) years on projects of similar size and complexity. Provide list of completed projects including project name and location, name of architect, name of material manufacturer, and approximate quantity of materials applied.
 - 2. Applicator's Personnel: Employ only persons trained for application of specified materials.
- B. Pre-application Meeting: Convene a pre-application meeting two (2) weeks before start of application of floor coating. Require attendance of parties directly affecting work of this section, including Contractor, Architect, applicator, and manufacturer's representative. Review surface preparation, priming, application, curing, protection, and coordination with other work.
- C. Static Coefficient of Friction: Finished resinous flooring shall have a tested coefficient of friction of 0.71 minimum dry, 0.6 minimum wet for level surfaces when tested in accordance with ASTM D2047 / UL410.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name, manufacturer, batch or lot number, and date of manufacture. Do not store in direct sunlight or high heat conditions.
- B. Storage:
 - 1. Store materials in accordance with manufacturer's instructions.
 - 2. Keep containers sealed until ready for use.

3. Do not subject material to excessive heat or freezing; do not apply material that has been subjected to excessive heat or freezing. Material subjected to excessive heat or freezing shall be separated from inventory and destroyed by mixing all three components. The solid reacted product shall be disposed of in environmentally sound and regulatory compliant manner.
 4. Shelf life: One year after date of manufacture, in unopened containers, under normal conditions.
- C. Handling: Protect materials during handling and application to prevent damage or contamination.
- D. Condition materials for use to 60–85 degrees F for 24 hours prior to application.

1.05 SITE CONDITIONS

- A. Do not apply materials if floor or air temperature is below 60 degrees F.
- B. Do not apply materials if relative humidity is above 85 percent or within 5 degrees of dew point at time of application
- C. Utilities, including electric, water, heat and finished lighting to be supplied by General Contractor
- D. Maintain room temperature between 60 degrees – 85 degrees F for 48 hours before, during and 48 hours after installation, or until cured.
- E. At the time of application ensure the minimum substrate temperature is above 60 degrees F and the substrate temperature is 5 degrees F above the measured dew point at the time of application.[Omit if not applicable]
- F. Erect suitable barriers and post legible signs at points of entry to prevent traffic and trades from entering the work area during application and cure period of the floor.
- G. Protection of finished floor from damage by subsequent trades shall be the responsibility of the General Contractor.

1.06 WARRANTY

- A. Provide a warranty covering materials and workmanship for a period of 1 year after date of installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the following manufacturers, except as otherwise approved by the Architect, subject to compliance with specifications requirements:
 1. General Polymers Corporation www.generalpolymers.com
 2. Harris Specialty Chemicals www.chemrex.com
 3. Tnemec Company Inc. www.tnemec.com
 4. Sika Corp., Industrial Flooring www.sikafloorusa.com
 5. Stonhard www.stonhard.com
- B. Specifications are based on Stonshield SLT as manufactured by Stonhard.

2.02 MATERIALS

- A. System: Stonshield SLT broadcast system nominal 3/32 to 1/8 inch thick with integral cove base.
- B. Primer: 2-component, penetrating, moisture tolerant, epoxy primer for concrete.
- C. Undercoat: 2-component, free flowing epoxy formulation consisting of resin and curing agent.
- D. Aggregate: brightly colored, quartz broadcast aggregate.
 - 1. Color: As selected by Architect from manufacturer's standard colors.
- E. Sealer: 2-component, high performance UV resistant, clear epoxy sealer.
- F. Integral Coved Base: Provide manufacturer's standard accessory materials necessary for integral coved base.
 - 1. Base Height: 4 inches, unless otherwise indicated on Drawings.
- G. Cementitious Repair/Resurfacer: SikaQuick 1000 cementitious repair/resurfacer, or equivalent as recommended by the resinous flooring manufacturer.
- H. Edge and Transition Strips: Roll-formed stainless steel edge strips, height as indicated; with integral perforated anchoring leg for setting the strip into the setting material.
 - 1. Height: As required to suit application.
 - 2. Finish: Brushed stainless steel, or as otherwise indicated on Interior Drawings.
 - 3. Products: Subject to compliance with specification requirements, provide one of the following, as necessary to suite application indicated:
 - a. Schlüter-SCHIENE, RONDEC, RENO, JOLLY.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine surfaces to receive resinous floor system. Notify Architect if surfaces are not acceptable. Do not begin surface preparation or application until unacceptable conditions have been corrected. Do not apply to substrate treatments for moisture, repair, or leveling not of the same Manufacturer.
- B. Do not apply resinous floor system to concrete less than 60 days old. Consult Technical Service prior to application when concrete has not cured for 60 days.
- C. Do not apply resinous floor system to sand-cement setting beds, regardless of condition. Sand-cement beds shall be removed to structural concrete substrate and re-leveled/sloped as necessary to achieve grade and/or adequate drainage.

3.02 SURFACE PREPARATION

- A. Prepare concrete surfaces in accordance with manufacturer's instructions and ASTM D4258.
- B. Remove dirt, oil, grease, wax, laitance, curing compounds, water-soluble concrete hardeners, and other surface contaminants.
- C. Remove sealers, finishes, and paints.

- D. Remove unsound concrete by scarifying, sand blasting, shot blasting, or high pressure water blasting.
- E. Chemical Surface Preparation: Chemical surface preparation (acid etching) is unacceptable and will void Manufacturer's warranty.
- F. Mechanical Surface Preparation:
 - 1. Mechanically abrade concrete surface in accordance with manufacturer's instructions.
 - 2. Leave concrete surface with an aggressive texture.
 - 3. Remove concrete dust.
 - 4. Conform to ASTM D4259.
 - 5. Surface profile shall conform to IRCI Guideline 03732 CSP 3, minimum.
- G. Control Joints/Cracks: Provide repair and treatment of control joints and surface cracks utilizing manufacturer's standard materials and installation details.

3.03 APPLICATION

- A. Repair concrete substrate as required using cementitious repair/resurfacer in accordance with Manufacturer's instructions.
- B. Install edge and transition strips level and consistent with building lines at locations indicated on Drawings.
- C. Do not add thinners to materials. No thinners shall be approved or allowed.
- D. Install materials in accordance with manufacturer's printed instructions using recommended application methods.
 - 1. Coverage Rates: Comply with manufacturer's data sheets for specified resinous flooring system.
 - 2. Completed System Thickness: 3/32 to 1/8 inch.
- E. Finish surface to be smooth with a light grit finish conforming to specified static coefficient of friction requirements and as approved by Architect, with uniform texture, free of surface defects, and without porous areas.
- F. Follow Manufacturer's recommendations on terminations, integral coved base, base terminations, drains, doorways, columns and floor-to-floor transitions.

3.04 CLEANING AND PROTECTION

- A. Remove masking, draping, and other protection from adjacent surfaces.
- B. Protect resinous flooring during curing from traffic and chemical spillage. Based on air temperature of 73 degrees F:
 - 1. Foot Traffic: 18 to 24 hours.
 - 2. Medium Wheeled Load 24 hours.
 - 3. Full Cure: 72 hours
- C. During the course of the Work and on completion of the Work, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 09 68 19

CARPET (VCTT SHEET FLOORING)

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes the following:
 - 1. Carpet (VCTT sheet flooring), and installation accessories.

1.02 SUBMITTALS

- A. Product Data: Submit Manufacturer's Specifications and recommended procedures for installing VCTT, adhesive, seam weld, and other accessories.
- B. Shop Drawings: Submit Drawings indicating seam locations and edging conditions in accordance with Manufacturer's recommendations.
- C. Samples: Submit 12 inch by 12 inch VCTT sample and 6 inch sample of edge strip in Manufacturer's standard colors. Provide the following information for each VCTT sample submitted:
 - 1. Name of Manufacturer.
 - 2. Name/pattern of VCTT.
- D. Certification:
 - 1. At least 30 days prior to scheduled installation, submit Manufacturer's anticipated shipping date, including certification that VCTT conforms to Specifications and approved samples.
 - 2. Provide certification from manufacturer that VCTT will not display or evidence a significant change in color due to exposure to atmospheric contaminants (Ozone or Oxides of Nitrogen) for 5 years.
- E. Quality Control Submittals:
 - 1. Manufacturer shall furnish roll numbers and other information which will enable identification of VCTT. Inspect VCTT after manufacture for manufacturing defects.
 - 2. Certificates: Certification that submitted samples conform to Specification requirements.
- F. Contract Closeout Submittals: Submit the following in accordance with Section 01 77 00:
 - 1. Maintenance: Submit 2 copies of Manufacturer's instructions for VCTT care and cleaning. Instructions shall include shampooing and removal of stains and burns.
 - 2. Warranty. Submit manufacturer's warranty.

1.03 QUALITY ASSURANCE

- A. VCTT Installer Qualifications:
 - 1. Minimum of 5 years commercial installation experience.
 - 2. Review Manufacturer's recommendations and recommend in writing to Architect variations required to assure installation guarantee.

- B. Standards: Comply with the following:
 - 1. Flammability: Passes (CPSC 16 CFR, Part 1630).
 - 2. Flame Spread: Critical Radiant Flux Class I, not less than 0.45 Watts per cm² (NFPA 253 or ASTM E-648, in direct glue-down application).
 - 3. Optical Smoke Density Requirements (ASTM E662-79): Less than 450 (NBS Smoke Density Chamber - NFPA-258).
 - 4. Static Propensity: Under 3.0 KV (AATCC-134).
 - 5. Colorfastness: Carpet shall not display or evidence a significant change in color due to exposure to atmospheric contaminants (Ozone or Oxides of Nitrogen) for 5 years.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with each roll having register number tags attached or register identification stenciled on mill wrappings and intact.
- B. Storage and Protection: Store in well ventilated spaces protected from damage, dirt, stains, moisture and other adverse conditions. Products and installation materials shall be stored between 65 deg. F and 90 deg. F for at least 48 hours prior to installation.

1.05 PROJECT CONDITIONS

- A. Field Measurements: Verify installation dimensions by making field measurements.
- B. Temperature of the interior environment, including the sub floor should be no lower than 65 deg. F and no higher than 90 deg. F at least 72 hours prior to, during and after the installation. Relative humidity should not exceed 65 percent as it will retard primer and adhesive set times.

1.06 WARRANTY

- A. Special Project Warranty: Provide special project warranty, signed by Contractor, Installer, and VCTT Manufacturer agreeing to repair or replace defective materials and workmanship, during 10 year warranty period following Substantial Completion. Special project warranty includes, but is not limited to, following:
 - 1. Delamination of adhered VCTT from substrate.
 - 2. Raveling, snags, or runs.
 - 3. Permanent indentation of VCTT product.
- B. Manufacturer's Warranty: In addition to Special Project Warranty, provide manufacturer's Limited 10 Year Wear Warranty on manufacturer's standard form. Manufacturer's warranty shall include dimensional stability, wear and static resistance.

1.07 MAINTENANCE

- A. Extra Materials: VCTT scraps and trimmings more than 3 feet in one dimension shall be neatly packaged in small quantities and delivered to Owner at Project Closeout.

- E. Seam Weld: Tandus #54, or equivalent manufacturer approved seam weld.
- F. Edge Strip: Metal or vinyl reducer strip for areas, doorways and other areas where edge of VCTT is exposed.
- G. Resilient Base: As specified in Section 09 65 13. Base shall be installed after VCTT.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
 - 1. Conduct MVER and RH testing only after HVAC system is functioning 24/7 for two weeks prior to installation and the indoor air quality has acclimated to occupancy conditions.
 - 2. Where required by manufacturer (In the event that free liquids and/or moisture stained concrete are observed), conduct moisture vapor emission rate (MVER) testing per ASTM F1869 (Standard Test Method for Measuring Moisture Emission Rate of Concrete) and In-Situ RH testing per ASTM F2170 (Standard Test Method for Measuring Relative Humidity in Concrete). Provide at least 1 MVER and 2 RH tests on the initial 1000 sq ft, and a minimum of one test, alternating between MVER and RH, per 1000 sq ft for the balance of the project. Tested MVER and RH shall be within manufacturer's allowable levels prior to start of installation.
 - 3. Test concrete for acidity/alkalinity which shall test 9.0 or less as tested according to ASTM F-710-05. Frequency of tests shall comply with manufacturer's guidelines.
- B. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 PREPARATION

- A. Surface Preparation: Prepare subfloor to comply with criteria established in Manufacturer's installation instruction, with no exceptions, and as follows. Use only preparation materials that are acceptable to Manufacturer.
 - 1. Inspect surfaces to receive VCTT, make tests recommended by VCTT Manufacturer, take necessary corrective action.
 - 2. Grind ridges in concrete floors level and smooth.
 - 3. Fill cracks, construction joints and other surface imperfections with latex underlayment compound troweled level with adjacent surfaces.
 - 4. Telegraphing of irregularities in subfloor shall be sufficient cause for rejection.
 - 5. Remove foreign and incompatible materials and vacuum clean surfaces immediately prior to installation.
 - 6. Contractor shall provide written moisture and alkali test results pertaining to the concrete slab prior to installation.
 - 7. Verify subfloor is smooth and flat within 1/8 inch in 10 feet and ready to receive VCTT.
 - 8. Verify subfloor is dust-free and free of substances that would impair bonding of product to floor.

3.03 FLOOR PRIMING

- A. All porous, gritty, chalky and dusty surfaces should be primed using Tandus C-56E Premium Floor Primer. All patched areas must be fully primed. Primer can be applied using a paint roller. Allow the primer to dry completely. Primer turns light blue and will not transfer to the touch when dry.

3.04 INSTALLATION – GENERAL

- A. Install VCTT in strict accordance with Manufacturer's printed installation instructions (Form #006, revised 8/22/2013), and the following.
- B. Verify match before cutting to ensure minimum variation between dye lots.
- C. Layout VCTT and locate seams in accordance with approved Shop Drawings.
 - a. Locate seams in areas of least traffic, out of areas of pivoting traffic, and parallel to main traffic. Minimize cross seams.
 - b. Do not locate seams perpendicular through door openings.
 - c. Align run of pile in same direction as anticipated traffic and in same direction on adjacent pieces.
 - d. Locate change of color or pattern between rooms under door centerline.
 - e. Provide monolithic color, pattern, and texture match within any one room.
- D. Install VCTT tight and flat on sub-floor, well fastened at edges, with a uniform appearance.
- E. Double-cut VCTT seams with accurate pattern match. Make cuts true, and unfrayed.
- F. Chemically weld all seams with specified seam sealer as stated in installation instructions. Make sure seam is fully welded.
- G. Roll with appropriate roller for complete contact of VCTT with adhesive to subfloor.
- H. Trim carpet neatly at all walls and around interruptions.
- I. Completed VCTT Powerbond is to be smooth and free of bubbles, puckers, and other defects.

3.05 EDGE STRIPS

- A. Edge Strips:
 - 1. Install where indicated on Drawings, where VCTT terminates, and where VCTT abuts a dissimilar floor material.
 - 2. Securely fasten edge strips with concealed fasteners. Center under doors at doorways.

3.06 CLEANING

- A. Remove excess adhesive and/or seam sealer from floor and wall surfaces without damaging VCTT or adjacent surfaces.
- B. Thoroughly vacuum and clean VCTT after other Trades have been completed using a beater brush/bar commercial vacuum. Installed VCTT material shall be left free from adhesives, scraps, carpet ripples, scallop and puckers.

- C. Soiled spots shall be cleaned with spot remover approved by VCTT Manufacturer and loose threads removed with sharp scissors. Installed carpeting material shall be free from defects at time of final acceptance by Owner.
- D. During the course of the Work and on completion, remove and properly dispose of rubbish, wrappings, trimmings, equipment and debris away from premises.

3.07 PROTECTION

- A. Protect installed VCTT against soiling abuse or damage by other Trades, and cover completed Work with Kraft paper or other approved floor protection cover as necessary to ensure protection.
- B. Repair or replace damaged Work.

END OF SECTION

SECTION 09 77 33

FRP WALL PANELS

PART 1 GENERAL

1.01 SUBMITTALS

- A. Product Data: Manufacturer's Specifications and installation instructions for each material and accessory.
- B. Submit Manufacturer's full range of color and pattern samples of wall panels and trim pieces for Architect's selection. Submit two samples of selected products.
- C. Submit cleaning and maintenance instructions in accordance with Section 01 77 00.

1.02 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials clearly labeled to identify Manufacturer, brand name, quality or grade and fire hazard classification.
- B. Store horizontally in original undamaged packages.

1.03 PROJECT/SITE CONDITIONS

- A. Environmental Requirements: Install materials when temperature and humidity conditions approximate conditions that will exist when building is occupied.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the specified Manufacturers, except as approved by the Architect, subject to compliance with Specification requirements.
 - 1. Crane Composites, Inc. (Kemlite), Channahon, IL (800) 435-0080 www.kemlite.com
 - 2. Marlite, Inc., Dover, OH (303) 343-6621 www.marlite.com

2.02 MATERIALS

- A. FRP Panels: Fiberglass reinforced plastic panels complying with the following:
 - 1. Class: Class I (A) FR panels.
 - 2. Thickness: 0.090.
 - 3. Texture: Smooth.
 - 4. Color: White, unless otherwise indicated on Drawings.
- B. Adhesive for panel installation: Manufacturer's recommended type for use with selected materials, waterproof, mildew resistant nonstaining type.
- C. Edge Sealant: Type "E" clear mildew resistant silicone sealant as specified in Section 07 92 00, or mildew resistant sealant recommended by manufacturer for sealing panel edges and moldings.

- D. Moldings: All molding shall be 1-piece vinyl of the following types, color to match FRP.
 - 1. Panel Edges: "J" type Cap molding.
 - 2. Panel to Panel: "H" type Division Bar molding.
 - 3. Inside Corner: "J" type Inside Corner molding with radius edge.
 - 4. Outside Corner: "J" type Outside Corner molding with extended leg.
 - 5. Ceiling: "J" type Ceiling molding with radius edge, or use inside corner molding.
- E. Fasteners: Manufacturer's standard nylon drive pins.
- F. Miscellaneous Items: Furnish and install supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation whether or not specified or indicated.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions:
 - 1. Examine substrate and conditions under which the material is to be installed.
 - 2. Verify that surfaces, when tested with moisture meter, have proper moisture content.
 - 3. Verify that nails and screws are recessed, with joints and depressions taped, finish and sealed.
 - 4. Remove contaminants from areas to be covered.
 - 5. Do not proceed with Work until Work of other Trades which passes through wall covering has been completed and unsatisfactory conditions have been corrected.
 - 6. Start of Work indicates acceptance of responsibility for performance and any required remedial Work.

3.02 INSTALLATION

- A. Install panels in accordance with Manufacturer's printed instructions using full sheet mastic coverage method plus nylon fasteners.
- B. Make joints with 1/8 inch space for expansion and use moldings designed for each condition for the Project.
- C. Bevel back edges of panels with block plane to permit proper fit into moldings.
- D. Place a continuous bead of sealant in the receiver channel of all moldings immediately prior to installation of FRP panels. Place continuous bead of sealant at all edges and tool to smooth, slightly concave shape.
- E. If one end of panel must be mechanically fastened, do not fasten the other end.
- F. Remove plumbing escutcheons, switchplates, wall plates, and surface-mounted fixtures, and cut wall paneling evenly to fit. Replace items after completion of Work.
- G. Where applicable, install paneling before installation of plumbing, casings, bases, cabinets and other items to be applied over paneling.

3.03 CLEANING

- A. Remove excess adhesive and smudges with soft cloth and mineral spirits.

END OF SECTION

SECTION 09 91 00

PAINTING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Painting as specified and as noted on Drawings.
 - 2. Surfaces requiring finishing and left unfinished by the requirements of other Sections shall be painted or finished as part of the Work of this Section.

1.02 DEFINITIONS

- A. Touch-Up: Painting of items missed by painter at no additional cost to Owner.
- B. Re-Paint: Repairs to paint work for damages caused by other trades.
- C. Properly Painted Surfaces: Surface that is uniform in appearance, color, and sheen, and free of foreign material, lumps, skins, runs, sags, holidays, misses, strike-through, and insufficient coverage. Surface free of drips, splatters, spills, and overspray caused by Paint Applicator. Compliance will be determined when viewed without magnification at a distance of 5 feet minimum under normal lighting conditions and from normal veiling position (MPI(a), PDCA P1.92).
- D. Damage Caused by Others: Damage caused by individuals other than those under direct control of Painting Applicator (MPI(a), PDCA P1.92).
- E. Latent Damage: Damage or conditions beyond control of Painting Applicator caused by conditions not apparent at time of initial painting or coating work.

1.03 SUBMITTALS

- A. Product Data: Submit schedule of manufacturers of products required for the Work, together with specifications recommended by each manufacturer.
- B. Samples: Submit samples of each type of finish specified.
 - 1. Architect will furnish Contractor a color schedule of colors selected either from manufacturer's stock colors or specially requested color mixes before Work is begun.
 - 2. Submit three 8 inch x 10 inch samples of each color, including the correct sheen and texture, on heavy cardboard or masonry. Submit sealer and stain finishes on material of the same quality and species of wood on which that particular finish shall be used. Rejected samples shall be resubmitted until approved.
 - 3. Samples shall be submitted at least 30 days prior to the start of painting work. Label and identify each sample as to location and application. Upon submittal of color samples, minor variations or changes in color selection may be requested by the Architect and new samples ordered, until final color approval.

1.04 QUALITY ASSURANCE

- A. Standards: Preparation, application and workmanship shall be in accordance with manufacturer's recommendations and applicable provisions of the following:
 - 1. Master Painters Institute (MPI) Architectural Painting Specification Manual.
 - 2. Gypsum Association - GA210, "Gypsum Board for Walls and Ceilings."
- B. MPI Grade: All work shall be performed in accordance with MPI Premium Grade finish requirements.
- C. Design Criteria: Systems specified are in addition to prime coats provided under other Specification Sections of the Project Manual.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Packing and Shipping: Deliver materials to site in manufacturer's sealed original containers with Manufacturer's original legends and labels intact on each container. Deliver amount of materials necessary to meet Project requirements in single shipment.
- B. Storage: Store materials in a single location.
 - 1. Adequately protect against damage while stored at site.
 - 2. In no case shall the amount or method of materials stored exceed the amount permitted or the manner allowed by local ordinances, state laws, or fire underwriter regulations.
 - 3. Keep storage area clean and rectify any damage to area at completion of work of this Section. Maintain storage area at 55 deg. F minimum.

1.06 PROJECT/SITE CONDITIONS

- A. Environmental Requirements: Do not apply exterior paint in damp or rainy weather or until after the surface has dried thoroughly from the effects of such weather.
 - 1. Perform painting operations at temperature and humidity conditions recommended by Manufacturer for each operation and for each product.
 - 2. Do not apply varnish or paint when temperature is below 50 degrees F.. Avoid painting surfaces exposed to hot sunlight.
 - 3. During interior application, maintain minimum temperature of 65 degrees F. unless otherwise directed by Architect or manufacturer's printed instructions. Hold temperature as constant as possible.
 - 4. Provide adequate ventilation at all times so the humidity cannot rise above the dew point of the coldest surface to be painted.
 - 5. Moisture-containing surfaces, such as concrete, stucco and cement plaster shall have a moisture content of less than 8 percent as measured by moisture meter. Remove surface salt deposits prior to painting. Verify that pH is neutral, or within acceptable limits of Paint Manufacturer. Paint after thoroughly cured.
 - 6. Apply painting systems at lighting level of 540 Lux (50 foot candles) minimum on surfaces to be painted. Inspection of painting work shall take place under same lighting conditions as application. If painting and coating work is applied under temporary lighting, deficiencies discovered upon installation of permanent lighting will be considered latent damage as defined in Article 1.02 of this Section and the MPI Architectural Painting Specification Manual.

1.07 MAINTENANCE

- A. Extra Materials: Provide painting materials in Manufacturer's original containers with originals labels intact, in each color and or sheen used. Upon completion of the Work, furnish Owner with one fresh gallon of each type and color of paint and finish used on this Project, including primers and undercoats used. Label containers with manufacturer's name, batch, date, color name, anticipated shelf life, mixture instructions, and cautions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of the following manufacturer, subject to compliance with specification requirements.
 - 1. Sherwin Williams www.sherwin-williams.com

2.02 MATERIALS

- A. Materials used for any painting system shall be from a single manufacturer, unless approved otherwise in writing by painting system manufacturer. Include such approvals in Product Data submittal.
- B. Provide materials in accordance with the Schedule of Paint Products at the end of this Section as applicable to project. Contractor shall provide either waterborne or solventborne products at contractor's option and as follows:
 - 1. Waterborne:
 - a. Provide where low odor and fast dry are desired.
 - b. Non-blocking materials shall be used for doors, door jambs, railings and other locations subject to handling, or where surfaces will come into contact with other painted surfaces or belongings.
 - 2. Solventborne:
 - a. Provide where harder finish is required (such as "wet" areas) and odor will not create problems with occupants.
 - b. These products shall not be used where color retention is a concern. Verify with Architect.
 - 3. Materials used shall comply with applicable Federal and local air pollution regulations, lead content laws, and current VOC requirements. If products listed in Schedule of Paint Products located at the end of this Section are not in compliance with regulations, laws, or requirements, Contractor shall notify Architect and shall provide information regarding substitute products.
- C. Basic painting materials such as linseed oil, shellac, turpentine, thinners, driers, and other similar products, shall be of highest quality, pure, be compatible with other coating materials, made by reputable, of manufacturer's listed or listed in MPI manuals, and have identifying labels on containers. Paint materials shall be factory fresh.
- D. Alternate materials submitted for prior approval shall have qualities and materials equal to the other listed manufacturer's scheduled, top of the line, first quality products. Materials selected for coating systems for each type of surface shall be the products of a single manufacturer.

- E. Standard Gloss Range: Provide paints in accordance with the following MPI standard ranges as measured in accordance with ASTM D523, and as indicated on the drawings:

<u>MPI Gloss and Sheen Standards</u>	<u>Gloss @ 60°</u>	<u>Sheen @ 85°</u>
Gloss Level 1 – traditional matte finish – flat	max. 5 units, and	max. 10 units
Gloss Level 2 – high side sheen flat – ‘velvet-like’ finish	max. 10 units, and	10-35 units
Gloss Level 3 – traditional ‘eggshell-like’ finish	10-25 units, and	10-35 units
Gloss Level 4 – ‘satin-like’ finish	20-35 units, and	min. 35 units
Gloss Level 5 – traditional semi-gloss	35-70 units	
Gloss Level 6 – traditional gloss	70-85 units	
Gloss Level 7 – a high gloss	more than 85 units	

- F. Paints shall be ready mixed except for field catalyzed coatings.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Before beginning work of this Section, examine and test subsurfaces to be painted or coated for adhesion of painting and coating systems. Report in writing to Architect conditions that will adversely affect adhesion of painting and coating work. Do not apply painting and coating systems until such adverse conditions are corrected by party responsible for adverse conditions. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Report defects in substrates that become apparent after application of primer or first finish coat to Architect in writing and do not proceed with further work on defective substrate until such defects are corrected by party responsible for defect.

3.02 PROTECTION

- A. Before painting, remove hardware, accessories, electrical plates, lighting fixtures and similar items and protect.
1. Provide “Wet-Paint” signs and other barricades and protections as required to protect adjacent surfaces and work of other trades, whether being painted or not.
 2. Mask permanent labels.
 3. Provide, distribute, and maintain a sufficient supply of clean drop cloths and other protective coverings.
 4. Protect foliage and other exterior finished surfaces from contact with cleaning materials and thoroughly flush with water after contact.
 5. On completion of each space, replace above items.
 6. Remove rags and waste used in painting operations from building each night. Take every precaution to avoid danger of fire.

3.03 SURFACE PREPARATION

- A. General: Prepare surfaces in accordance with MPI requirements and requirements of Manufacturer for each painting/coating system specified, unless instructed differently in Contract Documents. Bring conflicts to attention of Architect in writing.
1. Surfaces requiring painting or finishing shall be thoroughly dry and cured, free of dirt, dust, rust, stains, scale, mildew, wax, grease, oil, deteriorated substrates, bond-breakers, efflorescence and other foreign matter detrimental to the coating’s adhesion and performance. Repair voids, cracks, nicks and other surface defects with appropriate patching material. Finish flush with surrounding surfaces and match adjacent finish texture.

2. Spot prime marred or damaged shop coats on metal surfaces with appropriate metal primer.
 3. Determine moisture content of plaster, stucco, cementitious materials, wood and other moisture-holding materials by use of a reliable electronic moisture meter.
 4. Determine alkalinity of plaster, stucco and other cementitious materials by performing appropriate tests.
 5. Do not paint surfaces where moisture content or alkalinity exceeds that which is allowed by paint manufacturer.
 6. Do not perform exterior painting while surface is damp, unless recommended by Manufacturer, nor during rainy or frosty weather. Interior surfaces shall be dry before painting.
- B. Existing Surfaces:
1. Clean, sand, patch, repair and prepare existing surfaces to be painted so that such existing finished surfaces are indistinguishable from new surfaces.
 2. Surfaces which cannot be prepared or painted as specified shall be immediately brought to the attention of the Architect in writing.
 3. Remove loose peeling and checked paint.
 4. Remove mildew by washing the surface with a commercially available mildew killer/remover.
 5. Remove efflorescence by wire brushing, power brushing or washing. Thoroughly rinse surfaces wire brushed. After removal of efflorescence, wash the surface with a commercially available cleaner acceptable to the manufacturer of the substrate.
 6. Remove existing wallcovering and wash the surface to remove paste residue. Seal surface before making any surface repairs.
 7. Dull and roughen glossy surfaces to obtain proper adhesion by either sanding, washing with a tri-sodium phosphate solution, or treating with a liquid deglossing compound.
 8. Overlap and feather edge spot-primed areas.
- C. Wood:
1. Sandpaper in direction of grain to smooth and even surface, leaving no sanding marks, and then dust off. After primer or stain coat has been applied, thoroughly fill nail holes, minor holes, cracks and other surface imperfections with putty tinted with primer or stain to match wood or stain color. Bring putty flush with adjoining surfaces. Sand woodwork between coats to a smooth surface. Cover knots and sap streaks with a thin coat of shellac, or seal with a suitable stain blocking sealer.
 2. Finish door edges after final fitting.
 3. Backpriming: Backprime interior woodwork, which is to receive paint or enamel finish, with enamel undercoater paint.
- D. Steel and Iron:
1. Remove grease, oil, mill scale, rust and rust scale and touch-up chipped or abraded places on items that have been shop coated. Remove and reprime incompatible or damaged shop applied primers. Comply with the Steel Structures Painting Council's (SSPC) recommendations for cleaning of uncoated steel and iron surfaces.
 2. When area will be exposed to view, sandpaper the entire primed area smooth, feather the edge of surrounding undamaged prime coat and spot prime in a manner to eliminate evidence of repair.
 3. Where steel or iron at existing Work have a heavy coating of scale, remove by sand blasting, sanding, descaling, grinding or wire brushing, as necessary, to produce a satisfactory surface for painting.

- E. Galvanized Metal and Aluminum:
 - 1. Thoroughly clean by wiping surfaces with a non-hydrocarbon solvent that will not leave an oily residue. Apply surface conditioner or vinyl-wash pretreatment as required for proper adhesion if required by paint manufacturer. Prime galvanized metal with galvanized iron primer as recommended by paint manufacturer. A test sample of the complete painting system should be applied and checked for adhesion before final painting begins.
 - 2. Clean visible portions of throats of galvanized steel ductwork with solvent; wipe dry with clean rags and paint flat black.
- F. Concrete:
 - 1. Except for steam cured products, cure cement type surfaces from 60 to 90 days in accordance with Paint Manufacturer's recommendations before painting.
 - 2. The method of surface preparation shall be at Contractor's discretion, provided the results are satisfactory to the Architect, and the method is in compliance with applicable codes and requirements.
 - 3. Repair surfaces to be painted prior to application of prime and finish coat(s). Apply a tinted primer to the substrate to help identify surface imperfections. After the primer has thoroughly dried, patch, fill and repair surface imperfections to match and flush-out with adjacent finish texture and profile.
 - 4. Before first paint coat is applied, spot prime nails and other exposed metal occurring in the surfaces with a rust inhibitive primer as recommended by paint manufacturer.
- G. Plaster and Gypsum Board Surfaces:
 - 1. Fill cracks, holes or imperfections with compatible patching material and smooth off to match adjoining surfaces. Before painting, surfaces shall be first tested for dryness with a moisture testing device.
 - 2. Apply no paint or sealer on gypsum board or plaster when the moisture content exceeds 8 percent. Test sufficient areas in each space and as often as necessary to determine if the surface has the proper moisture content for painting. If the moisture content is between 8 percent and 12 percent, prime with alkali resistant primer.
 - 3. If 8 percent or less, prime with specified primer. Remove the dry salt deposits from plaster surfaces by brushing with a stiff brush before painting.

3.04 WORKMANSHIP

- A. Spread materials smoothly and evenly. Apply coats to not less than wet and dry film thicknesses and at spreading rates for specified products as recommended by Manufacturer, but not less than as specified for each paint system.
- B. Apply each coat of paint evenly and comply with manufacturer's drying time before applying subsequent coats.
- C. Touch up suction spots after application of first finish coat.
- D. Finished work shall be uniform, match approved color, texture and coverage, and free from runs, sags, clogging or excessive flooding. Make edges of paint adjoining other materials or colors sharp and clean, without overlapping. Where varnishes or enamel is used, lightly sand, dust and clean undercoats to obtain a smooth finish coat. Sand carefully between each coat with fine sandpaper as necessary to produce even, smooth surfaces and to provide proper adhesion of subsequent coats.
- E. Where clear finishes are required, ensure tinted fillers match wood. Work fillers well into the grain before set. Wipe excess from the surface.

- F. Where specific mil thicknesses are required, check thickness by the following methods:
 - 1. Over ferrous metal - Elecometer Film Gauge
 - 2. Other surfaces - Tooke Dry Mil Inspection Gauge
- G. Finished work shall be a 'Properly Painted Surface' as defined in this Section.

3.05 APPLICATION

- A. The number of coats scheduled is the minimum number of coats required. Additional coat(s) shall be applied, at no additional cost to the Owner, to completely hide base material, provide uniform color and to produce satisfactory finish results.
- B. Apply coatings without thinning except as specifically required by label directions, or required by these specifications. In such cases, thinning shall be the minimum reduction permitted.
- C. Priming will not be required on items delivered with prime or shop coats, unless otherwise specified, or if shop applied prime coat is not compatible with specified painting system. Touch up prime coats applied by others as required to ensure an even primed surface before applying finish coat.
- D. Block Fillers: Provide level of block fill as scheduled to conform with the following:
 - 1. Level 1 – Regular Fill: Minimum block fill, reduces irregularity in masonry profile. One coat, spray applied.
 - 2. Level 2 – Medium Full Fill: Masonry profile slightly reduced. One coat, spray applied and back-rolled.
 - 3. Level 3 – Full Fill: Minimum block fill required for semi-gloss and gloss finishes. Use where conformance with health regulations is required. Number of coats as required to conceal most of masonry texture, spray applied and back-rolled.
- E. Plumbing, Mechanical and Electrical:
 - 1. Exterior and interior exposed water, gas, waste piping, sprinkler piping, conduit, lighting and electrical panels, telephone terminal boxes, galvanized ducts and insulated ducts, shall be painted in areas other than mechanical rooms, unless otherwise scheduled.
 - 2. Paint exposed unfinished fixtures, metal ducts, switch boxes, control panels, devices, starters, junction boxes, vents, drains, and other similar items, as directed by Architect.
- F. Spray paint prime coated (not pre-finished) grilles and registers with enamel or lacquer to match walls and ceilings. Paint materials shall not sag, run or bind movable parts of grilles, registers, louvers, baffles and other similar items.
 - 1. Throats of ducts shall be given one coat of flat black paint, wherever visibility of the interior of the duct is allowed through registers or other similar items. At fiber lined duct, use black latex paint.
 - 2. Examine the Mechanical and Electrical Drawings and Specifications to determine the amount of exposed work to be painted.
- G. Paint exposed surfaces of every member, paint items inaccessible after installation before installation, if required to be painted. Paint all exposed surfaces of overhead roof or floor structures, including deck, except where specifically indicated not to be painted.
- H. Edges, tops, and bottoms of wood doors shall be sealed and finished with the same finish as the door faces, to meet door manufacturer's warranty requirements. Verify edge color with Architect as different colors may be selected for each face.

- I. Paint items fitted with finish hardware after hardware has been temporarily removed.
- J. Heating and other equipment on or adjacent to walls or surfaces scheduled for painting, shall be disconnected, using workmen skilled in appropriate trades and moved temporarily to permit painting of surface. Following completion of painting, replace and reconnect items.
- K. In multiple coat paint work, tint each succeeding coat with slightly lighter color, but approximating shade of final coat, to facilitate checking application of specified number of coats. Tint final coat to scheduled and approved color. Tint prime and undercoats to a color similar to finish coat. Each coat of material applied must be inspected and approved by the Architect before the application of the succeeding specified coat; otherwise no credit for the concealed coat will be given, and the Contractor shall assume the responsibility to recoat work in question. Contractor shall notify the Architect when each coat is completed.
- L. Brush, wipe or roll stain in 2 coat application. Avoid lap marks by maintaining "wet-edge" continually being merged with existing liquid coverage and stop only at natural edges, turns and breaking places.
- M. Do not paint over Underwriters' Laboratory labels, fusible links, exposed sprinkler heads and other similar items.
- N. Paint piping, electrical or other equipment, conduit, vents and other similar items, on roof or other exterior locations as directed by Architect.
- O. Paint surface of walls which will be concealed by cabinets and other items mounted on or attached to walls.

3.06 ADJUSTING

- A. Correct deficiencies in workmanship required to leave surfaces in conformance with 'Properly Painted Surface' as defined in this Section.

3.07 CLEANING

- A. During the course of the Work and upon completion of work, remove misplaced paint and stain spots or spills from floors, walls, glass, or other surfaces and leave work clean, orderly, and in acceptable condition. Remove debris caused by work of this Section from premises. Leave Work in clean condition acceptable to Architect and Owner.
- B. Remove oily rags and waste daily, taking precaution to prevent fire.

3.08 SCHEDULES

- A. Color Schedule:
 - 1. Architect will provide a complete schedule of colors. Colors may be selected from various manufacturer's color palettes. Manufacturer supplying paint shall match these colors. Contractor shall prepare duplicate set of samples of treatments for major surfaces. If a specific surface or item receiving a paint finish does not have a specific color indicated or selected by the Architect, obtain clarification from the Architect. Do not assume the confirmation of the same color on the adjacent surfaces.
 - 2. Final coat of paint shall not be applied until colors have been approved by the Architect.

- B. Schedule of Finishes: Refer to the "Finish Schedule" on the Drawing for designated finishes of areas.
- C. Finishing of the following listed items and materials will not be required and shall be protected, except where explicitly specified otherwise:
 - 1. Stainless Steel, brass, bronze, copper, nickel, monel metal, chromium, anodized aluminum; specially finished articles such as porcelain enamel, plastic coated fabrics, and baked enamel, unless otherwise indicated.
 - 2. Finished products such as ceramic tile, glass, stone and stone tile, resilient flooring, acoustical ceiling tiles, panels and suspension systems.
 - 3. Pre-finished products such as wood doors, operable partitions, wood casework, and similar items.

3.09 EXTERIOR PAINT FINISHES

- A. This schedule uses the generic names listed in the Schedule of Paint Products.
- B. System 101 (Ferrous Metals): Apply to exposed steel such as metal doors and frames, grilles, light fixture standards in parking areas, metal handrails, sectional and coiling doors, and other exposed miscellaneous ferrous metals that are not pre-finished.
 - 1. 1st Coat: Ferrous Metal Primer (Red or White color as applicable to finish coats).
 - 2. 2nd Coat: Same material as 3rd coat in accordance with manufacturer's recommendations.
 - 3. 3rd Coat:
 - a. Flat: Paint - Waterborne (100% Acrylic) (if noted on Drawings). Sheen shall be 4 to 6% per a 85 degree gloss meter.
 - b. Semi-Gloss unless noted otherwise. Enamel, Semi-Gloss - Waterborne (100% Acrylic - Non-Blocking).
- C. System 102 (Galvanized Metals): Apply to exposed galvanized metal such as copings, louvers and metal flashings.
 - 1. Clean metal to remove foreign matter or any coating applied by the metal manufacturer. Apply Surface Conditioner or Vinyl Wash Pretreatment (if required by paint manufacturer).
 - 2. 1st Coat: Galvanized Metal Primer.
 - 3. 2nd Coat: Same material as 3rd coat as recommended by manufacturer.
 - 4. 3rd Coat:
 - a. Flat: Paint, Flat - Waterborne (100% Acrylic) unless noted otherwise.
 - b. Semi-Gloss (if noted on Drawings): Enamel, Semi-Gloss - Waterborne (100% Acrylic - Non-Blocking).
 - c. Gloss (if noted on Drawings): Enamel, Gloss - Waterborne (100% Acrylic - Non-Blocking).
- D. System 103 (Aluminum): Apply to exterior louvers and other miscellaneous exposed exterior unfinished aluminum surfaces.
 - 1. Clean metal to remove foreign matter or any coating applied by the metal manufacturer. Apply Surface Conditioner or Vinyl Wash Pretreatment.
 - 2. 1st Coat: Aluminum Primer.
 - 3. 2nd Coat: Same material as 3rd coat as recommended by manufacturer.
 - 4. 3rd Coat:
 - a. Flat: Paint, Flat - Waterborne (100% Acrylic) (if noted on Drawings) Sheen shall be less than 10% per a 85 degree gloss meter.
 - b. Semi-Gloss unless noted otherwise. Enamel, Semi-Gloss - Waterborne (100% Acrylic - Non-Blocking).

- E. System 104 (Concrete Masonry Units): Apply to exterior concrete masonry unit construction indicated to be painted. Roller apply 2nd or 3rd coat.
1. 1st Coat: Concrete Masonry Block Filler. Provide Level 2 or 3 Fill as required by gloss.
 2. 2nd Coat: Same material as 3rd Coat as recommended by manufacturer.
 3. 3rd Coat:
 - a. Flat: Paint, Flat - Waterborne (100% Acrylic) unless noted otherwise. Sheen shall be 4 to 6% per a 85 degree gloss meter. One of the coats shall be roller applied.
 - b. Semi-Gloss (if noted on Drawings): Enamel, Semi-Gloss - Waterborne (100% Acrylic - Non-Blocking).
 - c. Gloss (if noted on Drawings): Enamel, Gloss – Waterborne (100% Acrylic - Non-Blocking).
- F. System 105 (Concrete and Stucco): Apply to exterior cementitious surfaces specifically indicated to be painted. Roller apply 2nd or 3rd coat.
1. 1st Coat: Concrete and Masonry Primer.
 2. 2nd Coat: Same material as 3rd coat as recommended by manufacturer.
 3. 3rd Coat:
 - a. Flat: Paint, Flat - Waterborne (100% Acrylic) unless noted otherwise. Sheen shall be 4 to 6% per a 85 degree gloss meter. One of the coats shall be roller applied.
 - b. Semi-Gloss (if noted on Drawings): Enamel, Semi-Gloss - Waterborne (100% Acrylic - Non-Blocking).
 - c. Gloss (if noted on Drawings): Enamel, Gloss – Waterborne (100% Acrylic - Non-Blocking).
- G. System 106 (Exterior Wood): Not Used.
- H. System 107 (Exterior Gypsum Board): Not Used.
- I. System 108 (Sealer – Masonry and Stucco Parapet Top and Back Surfaces): Not Used.

3.10 INTERIOR PAINT FINISHES

- A. This schedule uses the generic names listed in the Schedule of Paint Products.
- B. System 201 (Ferrous Metals): Apply to exposed metals such as steel doors, hollow metal frames, metal beam saddles, columns, grilles and registers, stair and hand railings, ladders, and other exposed miscellaneous metals.
1. 1st Coat: Ferrous Metal Primer (Red or White color as applicable to finish coats).
 2. 2nd Coat: Same material as 3rd Coat as recommended by manufacturer.
 3. 3rd Coat:
 - a. Eggshell: Enamel, Eggshell.
 - b. Semi-Gloss (if noted on Drawings): Enamel, Semi-Gloss.
 - c. Gloss (if noted on Drawings): Enamel Gloss.
- C. System 202 (Interior Wood Finishes - Enamel): Not Used.
- D. System 203 (Interior Wood Finish - Flat): Apply to plywood telephone backing boards and other miscellaneous softwood as noted, specified or scheduled.
1. 1st Coat: Enamel Undercoater/Primer.
 2. 2nd and 3rd Coat: Flat Paint, - Waterborne (Vinyl Acrylic)

- E. System 204 (Galvanized Metals): Apply to exposed galvanized metal.
 - 1. Clean metal to remove foreign matter or any coating applied by the metal manufacturer. Apply Surface Conditioner or Vinyl Wash Pretreatment (if required by paint manufacturer)
 - 2. 1st Coat: Galvanized Metal Primer
 - 3. 2nd and 3rd Coats:
 - a. Eggshell: Enamel, Eggshell
 - b. Semi-Gloss (if noted on Drawings): Enamel, Semi-Gloss
 - c. Gloss (if noted on Drawings): Enamel Gloss
- F. System 205 (Aluminum): Apply to interior louvers and other miscellaneous exposed unfinished aluminum surfaces.
 - 1. Clean metal to remove foreign matter or any coating applied by the metal manufacturer. Apply Surface Conditioner or Vinyl Wash Pretreatment.
 - 2. 1st Coat: Aluminum Primer
 - 3. 2nd and 3rd Coats:
 - a. Eggshell: Enamel, Eggshell
 - b. Semi-Gloss (if noted on Drawings): Enamel, Semi-Gloss
 - c. Gloss (if noted on Drawings): Enamel, Gloss
- G. System 206 (Gypsum Board, Plaster and Concrete - Wet Areas): Apply to gypsum board, plaster and concrete surfaces in toilet rooms, janitor rooms, kitchens, and other areas as scheduled.
 - 1. 1st Coat: Enamel Undercoater - Solventborne, unless noted otherwise.
 - 2. 2nd and 3rd Coats:
 - a. Eggshell (if noted on Drawings): Enamel, Eggshell - Solventborne.
 - b. Semi-Gloss: Enamel, Semi-Gloss - Solventborne or Enamel - Solventborne (Epoxy-Polyester).
- H. System 207 (Gypsum Board, Plaster and Concrete - Non-Wet Areas): Apply to gypsum board, plaster and concrete except for wet areas.
 - 1. 1st Coat: Waterborne Primer/Sealer. (Solventborne {Alkyd} shall be used at new untextured smooth gypsum board surfaces covered with powdery or unstable soft top joint cement)
 - 2. 2nd and 3rd Coat:
 - a. Eggshell: Enamel, Eggshell
 - b. Semi-Gloss (if noted on Drawings): Enamel, Semi-Gloss
 - c. Flat (if noted on Drawings): Paint, Flat
- I. System 208 (Ferrous Metal - Chemical Resistant Finish): Not Used.
- J. System 209 (Interior Concrete Masonry - Wet Areas): Not Used.
- K. System 210 (Interior Concrete Masonry or Plaster - Extremely Wet Areas): Not Used.
- L. System 211 (Interior Concrete Masonry - Non-Wet Areas): Apply to exposed interior concrete masonry block units except areas specified above for enamel finish.
 - 1. 1st Coat: Block Filler, w/o Aggregate. Provide Level 1, 2 or 3 Fill as required by gloss.
 - 2. 2nd Coat: Same material as 3rd Coat as recommended by manufacturer.
 - 3. 3rd Coat: Enamel, Semi-Gloss - Waterborne.
- M. System 212 (Acoustic Ceilings): Not Used.

3.11 STAIN AND CLEAR WOOD FINISHES

- A. This schedule uses the generic names listed in the Schedule of Paint Products.
- B. System 301 (Stained and Clear Finish): Apply to wood doors, handrails and chair rails. Fill open grain hardwood such as Oak.
 - 1. Stained and Finished with Clear Satin or Gloss Varnish - Solventborne:
 - a. 1st Coat: Semi-Transparent Stain - Solventborne (Oil)
 - b. 2nd Coat: Varnish, Gloss – Polyurethane (Solventborne)
 - c. 3rd Coat:
 - 1) Satin: Varnish, Satin – Polyurethane (Solventborne)
 - 2) Gloss: Varnish, Gloss – Polyurethane (Solventborne)
 - 2. Stained and Finished with Clear Satin or Gloss Varnish– Waterborne:
 - a. 1st Coat: Semi-Transparent Stain - Solventborne (Oil)
 - b. 2nd Coat: Varnish, Gloss – Polyurethane (Waterborne)
 - c. 3rd Coat:
 - 1) Satin: Varnish, Satin – Polyurethane (Waterborne)
 - 2) Gloss: Varnish, Gloss – Polyurethane (Waterborne)r

3.12 SCHEDULE OF PAINT PRODUCTS

- A. Only those products which are specifically required by this Section shall be provided. Products listed in the following Schedule that are not specified in this Section are for information only.

(continued)

EXTERIOR PRIMERS/UNDERCOATERS	Sherwin Williams
Red Ferrous Metal Primer	
Waterborne	B66-310
Solventborne	B50NZ3
Galvanized Metal Primer	
Waterborne	B66W1
Solventborne	B50WZ30
Vinyl Wash Pretreatment /Surface Conditioner	
Waterborne	B71Y1
Solventborne	N/A
Aluminum Metal Primer	
Waterborne	B66W1
Solventborne	B50XZ30
White Ferrous Metal Primer	
Waterborne	B66W1
Solventborne	B50Z WZ1
Concrete and Masonry Block Filler	
Waterborne (100% Acrylic)	B42W46
Waterborne (modified Copolymer)	B25W25
Solventborne	B42WA8/B42WA9
Concrete and Masonry Primer	
Waterborne	A24W300
Solventborne	B46WZ1000
Epoxy (2 component)	B42WW49
Masonry Surface Conditioner	
Waterborne	A24-100 Series
Solventborne	B46WZ1000
Exterior Gypsum Board Primer/Undercoater	
Waterborne	B42WJ50
Solventborne	Y24W20
Exterior Wood Primer	
Waterborne (100% acrylic)	B42WJ50
Solventborne	Y24W20
Multi-Purpose Primer	
Waterborne (100% acrylic)	B66W1
Solventborne	B50WZ4
High Build Polyamide Epoxy Primer (2 Part)	
Waterborne	B73A200/B73V200
Solventborne (ferrous metals)	B58-600/B58V600
Solventborne (galvanized metal)	B58-600/B58V600

EXTERIOR PAINT – FINISH COATS	Sherwin Williams
Paint, Flat (Gloss Rating 0-15 @ 85 degree gloss meter)	
Waterborne (Vinyl Acrylic)	B42WJ950
Waterborne (100% Acrylic)	A-100 (A6 Series)
Paint, Eggshell	
Waterborne (100% Acrylic)	B13WJ51
Solventborne	---
Enamel, Low Luster	
Waterborne (100% Acrylic - Non-Blocking)	A82
Solventborne	A11 Series
Enamel, Semi-Gloss	
Waterborne (100% Acrylic - Non-Blocking)	B66-200 Series
Solventborne	B54Z-400
Solventborne (Industrial)	B54Z-400
Solventborne (Acrylic Aliphatic Polyurethane - 2 Component)	B65-350/B60V30
Enamel, Gloss	
Waterborne (100% Acrylic - Non-Blocking)	B66W100
Solventborne (Quick Dry)	B54Z
Solventborne (Silicone)	B56-300
Solventborne (Industrial)	B54Z
Solventborne (Aliphatic Polyurethane - 2 Component)	B65-300/B60V30
Solventborne (Acrylic Aliphatic Polyurethane - 2 Component)	B65-300/B60V30
Elastomeric (Smooth)	
Waterborne (100% Acrylic)	A5-100 Series
Textured Coating, Smooth	
Waterborne (Vinyl Acrylic)	A44W800
Solventborne	---
Textured Coating, Medium	
Waterborne (Vinyl Acrylic)	A44W810
Solventborne	---
Textured Coating, Coarse	
Waterborne (Vinyl Acrylic)	A44W820
Floor Paint (Single or 2-component)	
Waterborne (Acrylic Epoxy)	B90 Series
Solventborne	B62Z-100
Aluminum Paint	
Solventborne	B65S14
Aluminum Metal	
Waterborne	B71-200
Solventborne	B65S14

INTERIOR PRIMERS/UNDERCOATERS	Sherwin Williams
Red Ferrous Metal Primer	
Waterborne	B66-310
Solventborne	B50NZ3
White Ferrous Metal Primer	
Waterborne	B66W1
Solventborne	B50 Series
Galvanized Metal Primer	
Waterborne	B66W1
Solventborne	B50WZ30
Aluminum Primer	
Waterborne	B66W1
Solventborne	B50WZ30
Primer/Sealer (for drywall, etc.)	
Waterborne (Vinyl Acrylic)	B28W601
Waterborne (Zero VOC)	B11W900
Solventborne (Alkyd)	B79W10
Vinyl Acrylic Wall Sealer	
Waterborne	B28W601
Enamel Undercoater/Primer	
Waterborne (100% Acrylic)	B28W101
Solventborne	B49WZ2
Block Filler, w/ Aggregate	
Waterborne	B42W200/B42V201
Solventborne	---
Block Filler, w/out Aggregate	
Waterborne	B25W25
Waterborne (100% Acrylic)	B42W46
Solventborne (Polyamide-Epoxy)	B42W400/B42V401
Epoxy Polyester Primer	
Waterborne	B70W100/B601V15
Solventborne	B58-600/B58V600
Vinyl Wash Pretreatment/Surface Conditioner	
Waterborne	B71Y1
Solventborne	B50WZ30
Concrete and Masonry Primer	
Waterborne	A24W300
Solventborne	B46WZ1000
Epoxy (Two Component)	B70W100/B60V15

INTERIOR PAINT - FINISH COATS	Sherwin Williams
Acoustic Paint	
Waterborne (Vinyl-Acrylic)	B30W700
Paint, Flat	
Waterborne (Vinyl Acrylic)	B30W400
Waterborne (Low Odor/Low VOC)	B5
Waterborne (Low Odor/Zero VOC)	B5
Solventborne	
Enamel, Low Sheen	
Waterborne (100% Acrylic)	A41 Series
Waterborne (Vinyl Acrylic)	B20W1400
Waterborne (Low Odor/Zero VOC)	B33WZ1101
Solventborne	
Enamel, Eggshell	
Waterborne (100% Acrylic)	B20 Series
Waterborne (Vinyl-Acrylic)	B20W4400
Waterborne (Low Odor/Zero VOC)	B9
Waterborne (Non-Blocking - 100% Acrylic)	B20W51
Solventborne	
Enamel, Semi-Gloss	
Waterborne (100% Acrylic)	B66-200
Waterborne (Non-Blocking - 100% Acrylic)	B31Series
Waterborne (Low Odor/Low VOC)	B10
Waterborne (Low Odor/Zero VOC)	B10
Waterborne (2 Component Epoxy)	B70-200/B60V25
Solventborne	B54Z
Solventborne (Industrial)	B54Z
Solventborne (Epoxy-Polyester)	B58-600
Enamel, Gloss	
Waterborne (Non-Blocking - 100% Acrylic)	B21 Series
Waterborne (2 Component Epoxy)	B70-200/B60V15
Waterborne (Low Odor/Low VOC)	---
Solventborne	B54Z
Solventborne (Quick Dry)	B54Z
Solventborne (Industrial)	B54Z
Solventborne (2-Component Epoxy)	B62Z100/B6VZ70
Solventborne (Polyamide-Epoxy)	B62Z- 100/B60VZ70
Floor Paint (Single or 2-component)	
Waterborne(Epoxy-Acrylic)	B90 Series
Solventborne	B62Z Series

(**Not 100% Acrylic, but is their top of line product)

INTERIOR STAIN	Sherwin Williams
Semi-Transparent Stain	
Waterborne (Water Repellent)	---
Waterborne	Minwax
Solventborne (Wiping)	S64 Series
Solventborne (Oil)	A49-200
Lacquer-Based Stain	
Waterborne	---
Solventborne	---
Pigmented Solid Color Stain	
Waterborne (100% Acrylic)	---
Solventborne (Oil)	---
Semi-Transparent Toner	
Waterborne (Water Repellent)	---
Solventborne (Oil)	---

INTERIOR CLEAR FINISHES	Sherwin Williams
Resin Sealer	
Waterborne	---
Solventborne	
Sanding Sealer	
Waterborne (Acrylic Urethane)	---
Solventborne (Brushing)	B26V3
Varnish, Flat	
Solventborne	---
Varnish, Satin (Low Sheen)	
Waterborne (Acrylic Urethane)	A68F90
Solventborne (Alkyd)	A66F390
Solventborne (Polyurethane)	A67F1
Varnish, Semi-Gloss	
Waterborne (Acrylic Urethane)	Polycrylic S/G
Waterborne (Acrylic)	Polycrylic S/G
Solventborne	---
Solventborne (Polyurethane)	Minwax S/G Polyurethane
Varnish, Gloss	
Waterborne (Acrylic Urethane)	A68V91
Solventborne	
	A66V391
Solventborne (Polyurethane)	A67V1
Spar Varnish, Gloss	
Solventborne	Minwax Helmsman
Paste Wax	
Solventborne	Minwax Pastewax
Lacquer Sanding Sealer	
Waterborne	T65F520
Solventborne	B44MJ82

INTERIOR CLEAR FINISHES (continued)	Sherwin Williams
Lacquer, Flat	
Waterborne	T75F528
Solventborne	---
Lacquer, Semi-Gloss	
Waterborne	T75F526
Solventborne	B44FJ86
Lacquer, Gloss	
Waterborne	T75C525
Solventborne	B44CJ89
Lacquer, Crystal Clear Sanding Sealer	
Waterborne	T65F520
Solventborne	---
Lacquer, Non-Yellowing, Flat	
Waterborne	T75F528
Solventborne	---
Lacquer, Non-Yellowing, Semi-Gloss	
Waterborne	T75F526
Solventborne	---
Lacquer, Non-Yellowing, Gloss	
Waterborne	T75C525
Solventborne	---

END OF SECTION

SECTION 10 14 00

SIGNAGE

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes interior and exterior code required identification signage.

1.02 SUBMITTALS

- A. Product Data: Submit Manufacturer's brochures indicating materials and finishes.
- B. Shop Drawings: Show sizes of members, method of construction, copy layout, and mounting details for proper mounting for interior signage and door identification signage. Furnish template for mounting metal letters.
- C. Samples: Submit sample letters, panels, and completed signs, fonts and proposed anchorages.

1.03 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with the following:
 - 1. ANSI A117.1, 2009 "Accessible and Usable Buildings and Facilities."
 - 2. Public Law 101-336 "The Americans with Disabilities Act of 1990 (ADA)."
 - 3. 2010 ADA Accessibility Guidelines (ADAAG).
 - 4. The Arizonaans with Disabilities Act of 1992 Administrative Rules (AzDAAG)

1.04 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.
- B. Storage and Protection: Store items in dry, protected areas. Adequately protect against damage while stored at the site. Keep free of corrosion or other damage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the following Manufacturers, except as approved by the Architect, subject to compliance with Specification requirements:
 - 1. Code Required Interior and Exterior ID Signage:
 - a. Apco Graphics Inc. www.apcosigns.com
 - b. ASI-Modulex www.asimodulex.com
 - c. Best Manufacturing Company www.bestsigns.com
 - d. Epic Sign Group www.epicsigngroup.com
 - e. Mountain States Specialties
 - f. SignsSource www.signsource.com
 - g. Simply Exit Signs (a SmartSign Store) www.simplyexitsigns.com
 - h. Skyline Signs Inc. www.skylinesigns.net
 - i. Vomar Products, Inc. www.vomarproducts.com
 - j. Other regional source as approved by Architect.

- B. Basis of Design: Drawings and Specifications are based on specified products complying with ERAU signage specifications.

2.02 MATERIALS

- A. Materials shall be new stock, free from defects, imperfections strength, durability, and appearance. Types of materials and colors shall be selected by Architect based on final signage design.
- B. Cast Acrylic Sheet: Provide cast (not extruded or continuous cast) methyl methacrylate monomer plastic sheet, in sizes and thicknesses indicated, with a minimum flexural strength of 16,000 psi when tested in accordance with ASTM D 790, a minimum allowable continuous service temperature of 176 deg F (80 deg C), and of the following general types:
 - 1. Colored Coatings for Acrylic Plastic Sheet: Use colored coatings, for background colors, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and are nonfading for the application intended. Color(s) as selected by Architect.
 - 2. Transparent Sheet: Where sheet material is indicated as "clear," provide colorless sheet in matte finish, with light transmittance of 92 percent, when tested in accordance with the requirements of ASTM D 1003.
 - 3. Opaque Sheet: Where sheet material is indicated as "opaque," provide colored opaque acrylic sheet in colors and finishes as selected by Architect from the manufacturer's standards.
- C. Melamine plastic laminate, 1/8 inch thick, rated non-static, fire retardant and self extinguishing.
- D. Fasteners: Use concealed fasteners fabricated from metals that are not corrosive to the sign material and mounting surface.
- E. Tape: VHB (very high bond) double-stick foam tape as manufactured by 3M.

2.03 PLASTIC SIGNAGE

- A. Interior Signage: All interior signage shall comply with applicable ADA requirements.
 - 1. Occupied Rooms: Apco IM series 8"X8" Pearl Grey #A78, Holder SH-88, Insert SI-SL-88 (clear lense) #A78 Pearl Grey, ADA Band Laminate size 23/8"X8", Photopolymer color #A78 Pearl Grey, ADA Graphic copy: HelveticaNeue-Bold (HM) size: 1" color: AO2 Black (braille color: same as background).
 - 2. Non-Occupied Rooms: Apco Acrylic Plaque series #341A size 2"X4" #a78 Pearl Grey silk screen graphic, HelveticaNeue-Bold (HM) size: 1" AO2 Black.
 - 3. Exit Signs: Products indicated on Drawings as manufactured by SimplyExitSigns.com
- B. Signage may be fabricated by Owner; cost shall be included as part of construction contract. Coordinate with Owner.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Construction Manager. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

- A. General: Locate sign units where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions.
- B. Install plumb and level in accordance with Manufacturer's instructions.
- C. Do not field cut any signage members.
- D. Clean and polish exposed surfaces.
- E. Wall/Door Mounted Signs: Attach panel signs to wall/door surfaces using the methods indicated below:
 - 1. Silicone-Adhesive Mounting: Use liquid silicone adhesive recommended by the sign manufacturer to attach sign units. Use double-sided vinyl tape where recommended by the sign manufacturer to hold the sign in place until the adhesive has fully cured.
 - 2. Double-Stick Tape Mounting: Clean surfaces to be joined and apply double stick tape to back of wall mounted signage in continuous strips at approximate 2 inch center to center spacing between strips. Apply sign to wall surface taking care to properly align and plumb signage before removing release paper.

3.03 CLEANING

- A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 10 21 13

PLASTIC TOILET COMPARTMENTS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Solid plastic toilet compartments and urinal screens as shown on Drawings and as specified of the following type:
 - 1. Compartment Style: Floor mounted, overhead (headrail) braced.
 - 2. Screen Style: Wall mounted.

1.02 SUBMITTALS

- A. Shop Drawings: Submit Shop Drawings showing plans, elevations, details of construction, finish color, hardware fittings and fastenings. Indicate locations of blocking or materials by others as necessary for proper fastening of units to wall construction.
- B. Samples: Submit four (4) samples of Manufacturer's standard colors and hardware for selection and approval by Architect.

1.03 PERFORMANCE REQUIREMENTS

- A. Fire Resistance: Partition materials shall comply with the following requirements, when tested in accordance with the ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials:
 - 1. Smoke Developed Index: Not to exceed 450
 - 2. Flame Spread Index: Not to exceed 75
 - 3. Material Fire Ratings:
 - a. National Fire Protection Association (NFPA): Class B
 - b. International Code Council (ICC): Class B

1.04 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with the following:
 - 1. ANSI A117.1, 2009 "Accessible and Usable Buildings and Facilities."
 - 2. Public Law 101-336 "The Americans with Disabilities Act of 1990 (ADA).
 - 3. 2010 ADA Accessibility Guidelines (ADAAG).
 - 4. The Arizonans with Disabilities Act of 1992 Administrative Rules (AzDAAG)
- B. Manufacturer's Qualifications: A company regularly engaged in manufacture of products specified in this section, and whose products have been in satisfactory use under similar service conditions for not less than 5 years.
- C. Installer's Qualifications: A Company or Individual, regularly engaged in installation of products specified in this Section, with a minimum of 5 years experience.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact. Protect finished surfaces with removable wrapping or coating which will not bond when exposed to sunlight.
- B. Storage: Adequately protect against damage while stored at the site.

1.06 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions shown on Drawings by taking field measurements; proper fit and attachment of parts is required.

1.07 WARRANTY

- A. Provide manufacturer's standard material warranty covering plastic against breakage, corrosion, and delamination under normal conditions for 25 years from the date of receipt by the customer. If materials are found to be defective during that period for reasons listed above, the materials will be replaced free of charge.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of the following Manufacturers, except as otherwise approved by the Architect, subject to compliance with Specification requirements.
 - 1. Scranton Products www.scrantonproducts.com
 - 2. As approved by Architect.

2.02 MATERIALS

- A. Doors, panels and pilasters shall be 1 inch thick constructed from High Density Polyethylene (HDPE) or Polypropylene (PP) resins. Partitions shall be fabricated from polymer resins compounded under high pressure, forming a single component which is waterproof, nonabsorbent and has a self-lubricating surface that resists marks from pens, pencils, markers and other writing instruments. All plastic components shall be covered with a protective plastic masking.
 - 1. Color and Pattern: Rotary Brushed Bronze.

2.03 CONSTRUCTION

- A. Doors, panels, and pilasters shall be 1 inch thick with all edges rounded to a radius.
- B. Doors and dividing panels shall be 55 inches high and mounted at 14 inches above the finished floor.
- C. Pilasters: 82 inches high, unless otherwise indicated on Drawings.

2.04 HARDWARE

- A. Door hardware shall be as noted:
 - 1. Hinges shall be 8 inches and fabricated from heavy-duty extruded aluminum (6463-T5 alloy) with bright dip anodized finish with wrap-around flanges, through bolted to doors and pilasters with stainless steel, torx head sex bolts. Hinges operate with field adjustable nylon cams. Cams can be field set in 30-degree increments.
 - 2. Door strike/keeper shall be 6 inches long and made of heavy-duty extruded aluminum (6436-T5 alloy) with a bright dip anodized finish and secured to the pilasters with stainless steel tamper resistant torx head sex bolts. Bumper shall be made of extruded black vinyl.
 - 3. Latch and housing shall be made of heavy-duty extruded aluminum (6463-T5 alloy). The latch housing shall have a bright dip anodized finish, and the slide bolt and button shall have a black anodized finish.

4. Each door shall be supplied with one coat hook/bumper and door pull made of chrome plated zamak. Handicapped doors shall be supplied with a second door pull and out swing doors with one door stop made of chrome plated zamak.
- B. Pilaster shoes shall be 3 inches high and made of stainless steel.
 1. Pilaster shoes shall be secured to the pilaster with a stainless steel tamper resistant torx head sex bolt.
- C. Wall Brackets: Full-height (continuous) Type, manufacturer's standard, stainless steel.
 1. Stirrup brackets shall be fastened to pilasters and panels with stainless steel tamper resistant torx head sex bolts.
- D. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum strip fastened to exposed bottom edges of solid-polymer components to prevent burning.
- E. Headrail shall be made of heavy-duty extruded aluminum (6463-T5 alloy) with anti-grip design and integrated curtain track.
 1. Finish: Clear anodized.
 2. Headrail shall be fastened to the headrail bracket by a stainless steel tamper resistant torx head sex bolt, and fastened at the top of the pilaster with stainless steel tamper resistant torx head screws.
- F. Headrail brackets shall be 20 gauge stainless steel with a satin finish and secured to the wall with a stainless steel tamper resistant torx head screws.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

- A. Install toilet partitions in strict accordance with Manufacturer's printed instructions, at locations indicated. Erect straight and plumb, with horizontal lines level.
- B. All doors and panels shall be mounted 14 inches above the finished floor.
- C. Overhead Bracing: Fasten headrail to tops of pilasters and headrail brackets by thru-bolting with one-way stainless steel sex bolts. Cadmium plated sex bolts shall not be allowed.

- D. Clearances
 - 1. Clearance at vertical edges of doors shall be uniform top and bottom and shall not exceed 1/2 inch.
 - 2. Provide clearance at the wall of approximately 1 inch or less for panels and 1 inch or less for pilasters. Conceal evidence of drilling, cutting and fitting to room finish in the finish Work.
- E. No evidence of cutting, drilling, and/or patching shall be visible on the finished work.

3.03 FIELD QUALITY CONTROL

- A. Adjust hardware for satisfactory operation. Adjust door hinges to hold door open at approximately 30 degrees. Upon completion of the installation, put each operating component through at least ten operating cycles. Adjust to achieve optimum operation.
- B. Upon completion of the installation, visually check exposed surfaces, and touch up scratches and abrasives to be completely invisible to the unaided eye from a distance of five feet.

3.04 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.
- B. Manufacturer's representative shall meet with Owner's maintenance personnel at project closeout to provide training regarding proper care and handling of maintenance of plastic toilet partitions.

END OF SECTION

SECTION 10 22 13

WIRE MESH PARTITIONS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes wire mesh partitions as indicated on Drawings and as specified herein.

1.02 SUBMITTALS

- A. Shop Drawings: Submit Drawings showing plan view, elevations, details, sizes of members, methods of construction and mounting techniques.
- B. Product Data: Submit Manufacturer's data for materials, including hardware.

1.03 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified with a minimum of 5 years documents experience.
- B. Installer Qualifications: Company specializing in performing Work of this Section with a minimum 5 years documented experience.
- C. Field Measurements: Confirm field measurements before fabrication, where possible. Allow for field adjustment of units.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact. Protect finished surfaces with removable wrapping or coating which will not bond when exposed to sunlight.
- B. Storage: Adequately protect against damage while stored at the site.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the following Manufacturers, except as otherwise approved by the Architect, subject to compliance with Specification requirements:
 - 1. Acorn Wire & Iron Products, Inc. www.acornwire.com
 - 2. California Wire Products Corp. www.cawire.com

2.02 MATERIALS

- A. Framing Members: ASTM A36, formed steel sections, or ASTM A500, Grade B cold formed steel tubing.
- B. Screen Wire: ASTM A510, uncoated crimped steel wire.
- C. Bolts, Nuts and Washers: Hot dip galvanized.

- D. Anchorage Devices: Drilled expansion bolts or chemical type concrete anchors as necessary.
- E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts, unobtrusively located, consistent with design of structure.

2.03 COMPONENTS

- A. Partition Frame and Wire Mesh:
 - 1. Wire: #10 W&M gauge steel wire 1-1/2 inch diamond mesh, securely clinched to channel frames.
 - 2. Vertical Frames: 1-1/4 inch X 5/8 inch roll formed 12 gauge 'C' shaped channel, specially formed to prevent telescoping, and provided with holes for bolting to adjacent panel.
 - 3. Horizontal Frames: 1 inch x 1/2 inch roll formed 12 gauge channel using mortise and tenon construction for extra strength.
 - 4. Center Stiffeners: (2) 1 inch X 1/2 inch roll formed 12 gauge channels riveted and welded for greater strength and rigidity.
 - 5. Top Capping Bar: 2-1/4 inch X 1 inch roll formed 12 gauge channel with 1/4 inch 'U' bolts 24 inches on center.
 - 6. Floor Shoes: Aluminum 2 inches high with set screw adjustment.
 - 7. Corner Posts: 1-1/4 inch X 1-1/4 inch x 1/8 inch 90 degree angle.
 - 8. All hardware and anchors are furnished for a complete installation.
- B. Door and Frame:
 - 1. Hinged Doors: Constructed of 1-1/4 inch x 1/2 inch x 12 gauge channel frame banded with 1/8 inch x 1-1/4 inch flat bar top and sides. 1-1/2 inch pair butt hinges welded to door sides and jambs.
 - 2. Floor Brace: 3-1/2 inch x 1-1/2 inch roll formed 12 gauge channel brace with base plate and mounting anchors.
 - 3. Adjustable Panel: 1-1/2 inch diamond #9 expanded metal panel securely attached with 1/4 inch machine screws to 1-1/4 inch x 1-1/4 inch angle.
 - 4. Locks: Equip doors with mortise type cylinder lock operated from outside with key, and from inside with recess knob.

2.04 FABRICATION

- A. Fabricate assemblies of framed sections to sizes and configurations indicated on Drawings, with framing members fitted, reinforced and braced, to suit design requirements.
- B. Fit and assemble in largest practical sections for delivery to site, ready for installation.
- C. Fabricate items with joints tightly fitted and secured.
- D. Grind exposed welds flush and smooth with adjacent finish surface. Ease exposed edges to small uniform radius.
- E. Make exposed joints flush and hairline.
- F. Provide components required for anchorage to supporting construction. Fabricate anchorage and related components of same material and finish as framing members.

2.05 FINISHES

- A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

- B. Finish: Finish all exposed components if wire mesh partitions with HVLP applied shop coat of manufacturer's standard enamel paint in color as selected by Architect from manufacturer's standard color selection.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

- A. Install partitions in accordance with Manufacturer's Instructions and approved Shop Drawings including all accessories required for complete installation.
- B. Erect partitions plumb, rigid, properly aligned, and securely fastened in place.
- C. Provide additional field bracing as necessary for rigid, secure installation.
- D. Perform field welding in accordance with AWS D1.1.
- E. After installation, touch-up field welds, scratched or damaged surfaces using field-applied paint to match color of shop-applied finish.

3.03 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 10 28 13

TOILET ACCESSORIES

PART 1 GENERAL

1.01 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with the following:
 - 1. ICC/ANSI A117.1, 2009 "Accessible and Usable Buildings and Facilities."
 - 2. Public Law 101-336 "The Americans with Disabilities Act of 1990 (ADA)."
 - 3. 2010 ADA Accessibility Guidelines (ADAAG).
 - 4. The Arizona Americans with Disabilities Act of 1992 Administrative Rules (AZDAAG).

1.02 SUBMITTALS

- A. Product Data: Submit Drawings and brochures of toilet accessory items showing sizes, construction and mounting techniques, and installation locations (Plans and Elevations).

1.03 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact. Protect finished surfaces with removable wrapping or coating which will not bond when exposed to sunlight.
- B. Storage: Adequately protect against damage while stored at site.
- C. Handling: Comply with Manufacturer's instructions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. To establish function, capacity and quality, toilet accessories are based on products specified below. Comparable toilet accessory products by one of the following Manufacturers may be provided, as approved by the Architect, subject to compliance with Specification requirements.
 - 1. Gamco www.gamcousa.com
 - 2. Georgia Pacific www.productcatalog.gp.com
 - 3. GOJO www.gojo.com
 - 4. Rubber Maid www.rubbermaidcommercial.com
 - 5. Tork www.torkusa.com
 - 6. Koala Kare Products, a Division of Bobrick (Changing Station Only)
www.koalabear.com.

2.02 MATERIALS

- A. Stainless Steel: AISI, Type 302/304, with satin No. 4 finish. Unless specified or indicated, the use of other stainless steel alloys shall not be allowed.
- B. Sheet Steel: Cold rolled, commercial quality, ASTM A1008. Surface preparation and metal pretreatment as required for applied finish.

- C. Chromium Plating: Nickel and chromium electro-deposited on metal, ASTM B456, Type SC 2.
- D. Galvanized Steel Mounting Devices: ASTM A123, hot-dip galvanized after fabrication.
- E. Locks: Tumbler type, keyed alike unless specified otherwise.
- F. Fasteners: Theft-proof screws. Use no adhesive mountings.
- G. Backing Plates: 16 gauge cold-rolled steel for mounting grab bars in stud partitions.

2.03 TOILET ACCESSORIES

- A. General: Provide each type of accessory by a single manufacturer to the greatest extent possible. Refer to Drawings for locations and mounting heights.
- B. Hand Soap Dispenser: GOJO® FMX-12™ Dispenser – Black.
- C. Paper Towel Dispenser: Tork Elevation Matic Hand Towel Roll Dispenser.
- D. Toilet Paper Dispenser: Georgia Pacific GP 59209 dispenser.
- E. Toilet Seat Cover Dispenser: Georgia-Pacific Safe-T-Gard 57748.
- F. Sanitary Napkin Receptacle: Rubber Maid 6140 Sanitary Napkin Receptacle with Rigid Liner.
- G. Grab Bars: Gamco, 1-1/2 inch diameter with concealed flanges in configurations shown on Drawings.
- H. Folding Shower Seat: Gamco 5181 reversible hand folding shower seat ADA, Ivory phenolic.
- I. Shower Curtain Rod and Curtain: Gamco SR100 Series extra heavy duty shower rod with 100CHSS hooks and 100SC shower curtain, size as required.
- J. Mop and Broom Holder: Gamco US-1, Utility shelf with mop/broom holder and rag hooks.
- K. Surface-Mounted Oval Design Baby Changing Stations: Baby Bear Oval Design Series.
 - 1. Basis of Design: Model KB108-12, grey granite color, as manufactured by Koala Kare Products, a Division of Bobrick.
 - 2. Materials: FDA approved rotationally-molded high-density polyethylene (HDPE).
 - 3. Operation: Concealed pneumatic cylinder providing controlled, slow opening and closing of the changing station bed.
 - 4. Hinge Mechanism: Steel pivot rod secured in a metal tube.
 - 5. Changing Surface: Contoured, concave and smooth, 307 sq. in.
 - 6. Safety Straps: Replaceable, snap-lock, nylon protective holding straps.
 - 7. Performance: Units exceed static load requirements called out by ASTM F2285, Standard Consumer Safety Performance Specification for Diaper Changing Stations for Commercial Use.
 - 8. Mounting: Surface-mounted with manufacturer-provided mounting hardware on 16 inch centers.
 - 9. Features: No hinge structure exposed on interior or exterior surfaces; two bag hooks.
 - 10. Instruction Graphics: Universal instruction graphics and safety messages in multiple languages.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Coordination with other Work: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

- A. Install items in accordance with Manufacturer's published instructions and approved installation drawings in locations as shown on Drawings, and in compliance with ANSI A117.1 as applicable.
- B. Secure toilet room accessories to adjacent walls and partitions in accordance with the Manufacturer's instructions for each item and each type of substrate construction and as follows:
 - 1. Attachment to Toilet Partitions: Secure at screw attachment point with sheet metal screws furnished by Manufacturer or by 3/16 inch diameter through-bolts.
 - 2. Attachments of Recessed Accessories: Place shims between framing and cabinet at screw attachment points.
 - 3. Attachment of Surface Mounted Accessories: At stud walls, provide concealed blocking or backing at screw points to allow attachments with No. 18 x 1-1/2 inch sheet metal screws. At solid walls, rawl plugs, expansion shields or toggle bolts shall be provided. Mirrors shall be locked to wall hangers by tightening locking screws concealed in lower frame. Soap dispensers shall be mounted with 4 inch clearance from filler top to underside of any horizontal projection.
- C. Grab Bars:
 - 1. Framed wall construction: Install concealed anchor plates to studs. Attachment to studs must be sufficient to withstand a horizontal pull of 300 pounds. Accurately position and fasten before wall finish is applied. After wall surface is finished, secure concealed mounting plate to anchor plate using stainless steel machine screws furnished by the Manufacturer.
 - 2. Toilet Compartments: Through-bolted connection to anchors.
- D. Surface-Mounted Baby Changing Stations: Install products in strict compliance with manufacturer's written instructions and recommendations, including the following:
 - 1. Verify blocking has been installed properly.
 - 2. Verify location does not interfere with door swings or use of fixtures.
 - 3. Use fasteners and anchors suitable for substrate and project conditions.
 - 4. Install units at location and height indicated on the Drawings.
 - 5. Install units level, plumb and in proper relationship with adjacent construction.
 - 6. Adjust for proper operation.
- E. Seal wall penetrations with sealant as specified in Section 07900 to prevent moisture penetration through joints around fixtures.

3.03 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 10 44 00

FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes the following:
 - 1. Fire extinguishers.
 - 2. Cabinets for fire extinguishers.

1.02 SUBMITTALS

- A. Product Data: Submit Manufacturer's data and installation instructions for each item, including construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - 1. Fire Extinguishers: Include rating and classification.
 - 2. Fire Extinguisher Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
- B. Samples for Initial Selection: For fire extinguisher cabinets with factory-applied color finishes.
- C. Samples for Verification: For each type of exposed factory-applied color finish required for cabinets, prepare 6 inch x 6 inch square Samples.

1.03 QUALITY ASSURANCE

- A. Standards: Comply with ANSI/UL 92 and 711.
- B. Regulatory Requirements: Conform to ANSI/NFPA 10 and the following:
 - 1. ANSI A117.1, 2009 "Accessible and Usable Buildings and Facilities."
 - 2. Public Law 101-336 "The Americans with Disabilities Act of 1990 (ADA)."
 - 3. 2010 ADA Accessibility Guidelines (ADAAG).
 - 4. The Arizonaans with Disabilities Act of 1992 Administrative Rules (AzDAAG).
 - 5. Fire extinguishers shall be listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
 - 6. Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
 - 7. Provide fire extinguishers approved, listed, and labeled by FMG.

1.04 COORDINATION

- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

1.05 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of portable fire extinguishers that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure of hydrostatic test according to NFPA 10.
 - b. Faulty operation of valves or release levers.
 - c. Warranty Period: Five years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the following Manufacturers, except as approved by the Architect, subject to compliance with Specification requirements:
 - 1. Amerex (Fire Extinguishers only) www.amerex-fire.com
 - 2. Larsen's Manufacturing Company www.larsensmfg.com
 - 3. J.L. Industries www.jlindustries.com
 - 4. Potter Roemer Fire Protection Equipment www.potterroemer.com

2.02 EQUIPMENT

- A. Multi-Purpose Dry Chemical Extinguisher:
 - 1. Capacity and UL Rating: 5 lbs., 2A-10B:C, or as otherwise required by Fire Official.
 - 2. Rechargeable type.
 - 3. Tank: DOT approved steel cylinder.
 - 4. Metal head, handles, valves and siphon tube. Plastic handles, valve assemblies and siphon tubes are not allowed.
 - 5. Replaceable molded valve stem seal.
 - 6. Pressure gauge.
- B. Fire Extinguisher Cabinet:
 - 1. Model 2409 Series as manufactured by Larsen's is acceptable.
 - 2. Trim Style and Projection: Surface mounted and semi-recessed, 1-1/2 inch square trim. Refer to Drawings for locations.
 - 3. Inside box dimensions: Manufacturer's standard for size of extinguisher specified.
 - 4. Door:
 - a. Vertical Duo, unless otherwise indicated.
 - b. Trim and Door (Steel): One piece, constructed of cold-rolled steel with Manufacturer's standard baked enamel or powder coated finish in standard color as selected by Architect.
 - c. Door Glazing: Plastic, clear, 1/8 inch thick acrylic.
 - 5. Recessed Box: Heavy gauge, black baked acrylic enamel box
 - 6. Cabinet Signage: Vertical lettering "FIRE EXTINGUISHER" on door; color red.
 - 7. Cabinet Mounting Hardware: Appropriate to cabinet.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged units.
- C. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 PREPARATION

- A. Prepare recesses for recessed cabinets as required by type and size of cabinet and trim style.

3.03 INSTALLATION

- A. Install items in accordance with Manufacturer's directions. Install cabinets and wall brackets plumb and level at heights shown on Drawings.
- B. Comply with regulatory requirements and anchor securely.
- C. Verify that extinguishers are charged and tagged.
- D. Place extinguishers in cabinets.

3.04 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 12 48 13

ENTRANCE FLOOR MATS AND FRAMES

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes recessed roll-up floor grids and frames as shown on Drawings and as specified.

1.02 SUBMITTALS

- A. Product Data: Manufacturers product specifications, installation and maintenance instructions.
- B. Shop Drawings: Show layout and types of grates and frames not less than half-scale sections of typical installations, details of patterns or designs, anchors, and accessories, and field measurements of slab recess to receive frames grates (if applicable).
- C. Samples for Selection Purposes: Actual sections of grate and frame material in a convenient but representative size showing full range of colors, textures, finishes and patterns available for each type of floor grate and frame specified.
- D. Samples for Verification Purposes: Not less than 6 inch square sections of grate material and 6 inch length of frame material in selected colors and finishes for each type of grate and frame specified.
- E. Installation, Operations and Maintenance data.

1.03 QUALITY ASSURANCE

- A. Single Source Responsibility: Obtain floor grates and frames from one source and from a single manufacturer.
- B. Rolling load: 300 lbs/wheel.
- C. Uniform load: 50,000 lbs/sq ft.
- D. Regulatory Requirements:
 - 1. ICC/ANSI A117.1, 2009 "Accessible and Usable Buildings and Facilities."
 - 2. Public Law 101-336 "The Americans with Disabilities Act of 1990 (ADA).
 - 3. 2010 ADA Accessibility Guidelines (ADAAG).
 - 4. The Arizonans with Disabilities Act of 1992 Administrative Rules (AzDAAG)

1.04 DELIVERY, STORAGE AND HANDLING

- A. Storage and Protection: Upon delivery to the job, store mats in a dry, ventilated space, and protect from damage.

1.05 WARRANTY

- A. Floor mats and frames shall be fabricated free of defects in materials and workmanship in accordance with the General Conditions, and the manufacturer shall offer a 2 year warranty against defects in materials and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of the following Manufacturer, except as otherwise approved by the Architect, subject to compliance with Specification requirements:
1. Babcock-Davis www.babcockdavis.com

2.02 ENTRANCE GRATE

- A. Entrance System Floor Grate: Babcock Davis Model envIRONtread G-285 roll-up mat with aluminum rails and fiber-reinforced rubber treads.
1. Tread Insert: envIRONtread® Nylon-reinforced buffed rubber that stand up to years of heavy wear.
 2. Overall Depth: 1-7/8 inch.
 3. Color: Gray.
 4. Rail: Aluminum Rail: ASTM B221, alloy 6063-T6
 5. Rail Finish: Standard mill finish.
 6. Rail Spacing: Spaced 1-1/2 inches on center with 1/8 inch gap between rails.
 7. Fasteners: Non-corrosive screws and anchors for securing frames together and to floors.
 8. Construction: Flexible low-density polyethylene hinge retained in a "captive" aluminum tread port, with drain holes to allow debris and moisture to flow through the mat and continuous bottom cushions to reduce noise. Fillers shall be serrated black vinyl for use when tread spacing cannot be maintain, or to fill irregular frame conditions.
 9. Rolling Load: 300 lbs/wheel.
 10. Uniform load: 50,000 lbs/sq ft.
- B. Grate Frame: Babcock-Davis F-1. Aluminum, Recessed Angle frame Extruded 6063-T5 aluminum alloy, 1-7/8 inch deep by 1/8 inch profile.
- C. Aluminum Finish: Manufacturer's standard Clear anodized finish.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine the areas and conditions under which the work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.
1. Verify recessed floor surface to receive grating and frame is flat and level with a tolerance of 1/8 inch over 10 feet in accordance with ACI 302.
- B. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this Work.
1. Coordinate block-out for mats with adjacent materials for accurate location and transition.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions, at locations shown and with top of products level with adjoining finished flooring where applicable.

- B. Coordinate top of product surfaces with swinging doors to provide under-door clearance.
 - 1. Provide necessary shims, spacers, and anchorages for proper location and secure attachment of frames to concrete.
- C. Upon completion of frame installations, provide temporary filler of plywood or fiberboard in grate recesses, and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and Project is near time of Substantial Completion.
- D. Install roll-up floor grid product when no further wheeled construction traffic will occur and wet type operations including painting and decorating are complete.

3.04 CLEANING

- A. Upon completion of this portion of the work, promptly clean exposed portions and remove traces of dirt, grease and foreign materials.

END OF SECTION

SECTION 12 48 14

ENTRANCE WALK-OFF MAT CARPET

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Entrance walk-off mat carpet.
 - 2. Installation accessories.

1.02 SUBMITTALS

- A. Shop Drawings: Submit Drawings indicating pattern type and direction, pile direction, cutouts, type and location of edge strips, transition details, type of subfloor and installation, etc., in accordance with Manufacturer's recommendations.
- B. Samples: 1 Full size sample of walk-off carpet in specified color.
- C. Test Reports: Submit reports for flammability, smoke density and static propensity from independent laboratory no more than 2 years old.
- D. Quality Control Submittals:
 - 1. Manufacturer shall furnish dye lot numbers and other information which will enable identification of walk-off carpet. Inspect walk-off carpet after manufacture for manufacturing defects.
 - 2. Certificates: Certification that submitted samples conform with Specification requirements.
- E. Contract Closeout Submittals: Submit the following in accordance with Section 01 77 00.
 - 1. Maintenance: Submit 2 copies of Manufacturer's instructions for walk-off carpet care and cleaning. Instructions shall include shampooing and removal of stains and burns.
 - 2. Warranty: Submit manufacturer's warranty.

1.03 QUALITY ASSURANCE

- A. Walk-Off Mat Carpet Installer Qualifications:
 - 1. Minimum of 5 years commercial installation experience.
 - 2. Review Manufacturer's recommendations and recommend in writing to Architect variations required to assure installation guarantee.
- B. Standards: Comply with the following:
 - 1. Flammability: Passes (CPSC 16 CFR, Part 1630).
 - 2. Flame Spread: Critical Radiant Flux Class I, not less than 0.45 Watts per cm² (NFPA 253 or ASTM E-648, in direct glue-down application).
 - 3. Optical Smoke Density Requirements (ASTM 662-79): Less than 450 (NBS Smoke Density Chamber - NFPA-258).
 - 4. Static Propensity: Under 3.0 KV (AATCC-134).
 - 5. Colorfastness: Carpet tile shall not display or evidence a significant change in color due to exposure to atmospheric contaminants (Ozone or Oxides of Nitrogen) for 5 years.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with each roll having register number tags attached or register identification stenciled on mill wrappings and intact.
- B. Storage and Protection: Store in well ventilated spaces protected from damage, dirt, stains, moisture and other adverse conditions. Products and installation materials shall be stored between 65 deg. F and 90 deg. F for at least 48 hours prior to installation.

1.05 PROJECT CONDITIONS

- A. Field Measurements: Verify installation dimensions by making field measurements.
- B. Temperature of the interior environment, including the sub floor should be no lower than 65 deg. F and no higher than 90 deg. F at least 72 hours prior to, during and after the installation. Relative humidity should not exceed 65 percent as it will retard primer and adhesive set times.

1.06 WARRANTY

- A. Special Project Warranty: Provide special project warranty, signed by Contractor, Installer, and Manufacturer agreeing to repair or replace defective materials and workmanship, during 10 year warranty period following Substantial Completion. Special project warranty includes, but is not limited to, following:
 - 1. Delamination of adhered walk-off carpet mat from substrate.
 - 2. More than 10 percent loss of face fiber.
 - 3. Curling.
 - 4. Edge raveling, snags, or runs.
- B. Manufacturer's Warranty: In addition to Special Project Warranty, provide manufacturer's Limited 10 Year Wear Warranty on manufacturer's standard form. Manufacturer's warranty shall include dimensional stability, wear and static resistance.

1.07 MAINTENANCE

- A. Extra Materials: Furnish quantity of full-size units equal to 10 percent of amount installed. Neatly package in small quantities and identify with labels clearly describing contents. Deliver to Owner at Project Closeout.

PART 2 PRODUCTS

2.01 PRODUCTS

- A. Entrance Walk-Off Mat Carpet: Provide entrance carpet tile scheduled on Drawings as manufactured by Tandus (a Tarkett Company) www.tandus.com

2.02 ACCESSORIES

- A. Underlayment: Portland cement-latex concrete floor filler for leveling concrete floor as recommended by Carpet Manufacturer.
- B. Floor Primer: Tandus C-56E, Premium Floor Primer, or equivalent manufacturer approved floor primer.

- C. Adhesive: Tandus C-TR, Adhesive, or equivalent manufacturer approved adhesive.
- D. Edge Strip: Metal or vinyl reducer strip for areas, doorways and other areas where edge of VCTT is exposed.
- E. Resilient Base: As specified in Section 09 65 13. Base shall be installed after walk-off mat carpet.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Comply with requirements of Section 09 68 19.

3.02 PREPARATION

- A. Surface Preparation: Comply with requirements of Section 09 68 19.

3.03 FLOOR PRIMING

- A. Apply primer in accordance with requirements of Section 09 68 19.

3.04 INSTALLATION

- A. Comply with requirements of Section 09 68 19.

3.05 CLEANING

- A. Comply with requirements of Section 09 68 19.

3.06 PROTECTION

- A. Comply with requirements of Section 09 68 19.

END OF SECTION

SECTION 12 93 00

SITE ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes site furnishings and accessories, including, but not limited to the following:
 - 1. Splash blocks.
 - 2. Tree grates.

1.02 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in manufacturer's original unopened packaging with labels intact. Protect finished surfaces with removable wrapping or coating which will not bond when exposed to sunlight.
- B. Storage: Adequately protect against damage while stored at the site.
- C. Handling: Comply with manufacturer's instructions.

PART 2 PRODUCTS

2.01 SITE ACCESSORIES

- A. Precast Concrete Splash Blocks: Plant-cast, 5,000 psi, air-entrained concrete splash blocks, size as indicated on Drawings by 3 inches deep with formed dish shape to direct water away from building.
- B. Tree Grates: Ironsmith Model "ADA Tree Grate," or equal as approved by Architect. Cast gray iron ASTM A48 class 30 minimum from 100 percent recycled post consumer materials, unfinished cast iron, with fine pebbly texture. Ironsmith, Inc. www.ironsmith.cc
 - 1. Size: 72 inches x 72 inches, 1/2 inch maximum slot openings, 1 inch ribs, 1-1/16 inch total thickness with 1/2 inch x 1 inch x 1/4 inch thick grinding pads for leveling.
 - 2. Provide with Model 7200F frame, unless otherwise indicated on Drawings.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

- A. Splash Blocks: Place on finished roof surface below each roof downspout location as indicated on Drawings.
- B. Tree Grates:
 - 1. Angle Frame: Set angle frame level and plumb for embedment in concrete. Place frame at depth required for grating to be flush with surface of finished concrete walk surface.
 - 2. Install units at locations indicated firmly seated to steel angle frame in accordance with manufacturer's printed instructions. Grind leveling pads as necessary to level grate.

END OF SECTION

SECTION 15000

COMMON REQUIREMENTS FOR AIR CONDITIONING

PART 1 GENERAL

2.1 DESCRIPTION

- A. Provisions of this section apply to all work specified in all section 15000 through 15599. In addition, work in these sections is governed by all provisions of the Contract Documents.

3.2 SUBMITTALS

- B. Submit shop drawings and all data required in accordance with Division 1, General Requirements. In addition, refer to Section 15010, Summary of Work for Air Conditioning, for submittals required under this section.

4.3 RECORD AND AS-BUILT DRAWINGS

- C. Provide Record Drawings which clearly show all differences between contract work as drawn and as installed for all concealed work as well as work added to the contract which is not shown on the original Contract Drawings. Dimension the location of all piping and ductwork, which is not accessible after construction.
- D. Maintain a set of record drawings at the job site. Keep legible and current and available for inspection at all times by the Architect. Show all changes in the contract work or work added on these drawings in a contrasting color.
- E. Upon completion of the work, transfer the information from the Record Drawings at the site to As-Built Drawings on sepia mylar obtained from the latest contract drawings. Stamp reproducibles "As-built" and date.
- F. Provide additional Record Drawings and As-built in accordance with Division 1, General Requirements.

5.4 WARRANTY

- G. Warrant the system, labor, materials, and equipment including all pre-selected and pre-purchased equipment for one year after completion and acceptance except as specified for a longer period elsewhere. Replace or repair all defective workmanship, equipment, and materials including all refrigerant lost at no additional cost to the Owner.

6.5 CHANGE ORDERS

- H. Should a change order to the contract documents be necessary, the contractor shall submit a formal change order to the architect/engineer.
- I. All change orders submitted shall be reviewed by the architect/engineer before any work commences. Any work done without prior written approval is subject to completion at the contractor's expense.
- J. Change orders shall include a detailed material, equipment, and labor take-off identifying all new and credited items. Costs for such items shall not exceed the values listed in the latest edition of the Means Estimating Guide.

PART 7 PRODUCTS

8.6 EQUIPMENT LIST AND MAINTENANCE

- K. Prior to completion of work, the Contractor shall compile a complete equipment list and operation and maintenance manual. After review and approval by the Architect, furnish three bound copies. The equipment list shall include the following items for every piece of material and equipment supplied under this section of the specifications including all pre-selected and pre-purchased equipment:
- Name, model, and manufacturer
 - Complete parts drawings and list
 - Local supply for parts or replacement with address & telephone numbers
 - Local service organization for equipment with address & telephone
 - All tags, inspection packages, inspection slips, etc., removed from equipment as shipped from the factory
 - Electrical wiring diagram as applicable
 - Approved submittals and shop drawings (One copy - see Section 15010 paragraph 2)
- L. Operation and maintenance manual shall include all available manufacturers' operation and maintenance instructions together with the As-built Drawings and all other diagrams and instructions necessary to properly operate and maintain the equipment. Include the name, address, and phone number of the General Contractor and all subcontractors involved in any of the work specified herein. The equipment list and maintenance manual shall be submitted in accordance with Division 1, General Requirements.

9.7 REGULATIONS, PERMITS, INSPECTIONS

- M. Regulations: All materials, equipment, and installations must comply with OSHA and all applicable codes, rules, and regulations, all of which shall be considered a part of these specifications.
- N. Permits: Obtain and pay for all permits and licenses required.
- O. Inspections: All work must be inspected and approved by local authorities.
- P. Prior to final approval, furnish the Architect certificates of inspections and approvals by the local authorities.

10.8 CLEARANCE FROM ELECTRICAL EQUIPMENT

- Q. Piping or ductwork:
1. Prohibited, except as noted, in:
 - Electric rooms and closets
 - Telephone rooms and closets
 - Elevator machine rooms
 - Electric switchboard room
 2. Prohibited, except as noted, over or within 5 ft. of:
 - Transformers
 - Substations
 - Switchboards
 - Motor control centers
 - Standby power plant
 - Bus ducts

11.9 EQUIPMENT DESIGN AND INSTALLATION

- R. Uniformity: Unless otherwise specified, provide all equipment of same type or classification by the same manufacturer.

- S. Application: Do not install any equipment in an application not recommended by the manufacturer.
- T. Design: Design all equipment in accordance with ASME, AGA, UL and other applicable technical standards as follows:
 - 3. Pressure vessels-ASME Code constructed and stamped
 - 4. Gas appliances-AGA listed and labeled
 - 5. Electric appliances-UL labeled
 - 6. Fire protection equipment-UL approved and labeled
 - 7. Fans-AMCA rated and stamped
 - 8. Cooling equipment-ARI certified
 - 9. Air conditioning equipment-UL approved and labeled as a unit

PART 12 EXECUTIONS

13.10 EXCAVATION AND BACKFILL

- U. Complete all excavation and backfill as necessary for the installation of underground piping and ductwork. Compact and tamp backfill to original grade in accordance with requirements as specified in section entitled "Earthwork" and remove excess dirt as directed. No work shall be covered until properly tested and approved. All pavement, sidewalk, piping, electrical conduit, etc., caused to be cut or damaged by this section shall be restored to original condition by workmen qualified and active in the trades involved.

14.11 DRAWINGS

- V. Working drawings: The drawings show the general arrangement of all air conditioning work. Should conditions require any re-arrangement to suit the design of equipment or piping furnished, submit working drawings showing in detail (minimum 1/4" /foot scale) and schematic all changes and receive approved return copies before proceeding with any work. Furnish and install all materials and equipment necessary for proper installation, operation, and service of the system and the equipment.
- W. Shop (Coordination) Drawings: The Contractor shall prepare complete shop drawings, (plans and sections minimum 1/4" /foot scale) coordinated with all other trades, of all equipment rooms, equipment areas and areas of concentrated ductwork and/or piping. Approved shop drawings shall be received by the Contractor prior to the fabrication or installation of any materials or equipment.
- X. Space Requirements: Should the particular equipment he proposes to install require other space conditions than those indicated, the Contractor shall arrange for such space before submitting his bid. Any changes which become necessary on account of failure to comply with this paragraph shall be made at the Contractor's expense.

15.12 INTERFERENCE

- Y. Arrange the work schedule to prevent interferences with the work of other trades and cooperate with other trades. Sleeves and openings shall be located and sleeves provided where required.
- Z. Report to Architect, in writing, conditions which will prevent proper provision of this work.

- AA. Beginning work of any Section without reporting unsuitable conditions to the Architect constitutes acceptance of conditions by Contractor.
- BB. Perform any required removal, repair, or replacement of this work caused by unsuitable conditions at no additional cost to the Owner.

16.13 ACCESSIBILITY

- CC. Unions, valves, controls, etc., shall not be placed in any pipeline at a location that will be inaccessible after the system is complete.
- DD. All valves, damper quadrants, motors, bearings, controls, and other apparatus which must be located in an inaccessible location shall be provided with suitable hinged access doors or covers (fitted in a framed opening) which will permit proper operation and servicing of the apparatus.

17.14 PROTECTION OF APPARATUS

- EE. At all times take such precautions as are necessary to protect the apparatus from damage caused by theft, the weather, and all building operations. Failure to protect the material and apparatus adequately shall be sufficient cause for the rejection of any damaged material or equipment. All pipe and equipment openings shall be closed to prevent obstruction and damage.

18.15 CONTRACTION AND EXPANSION

- FF. Install all work in such a manner that its contraction and expansion will not do any damage to the ductwork, pipes, the connected equipment, or the building. Install offsets, swing joints, expansion joints, etc., as required to prevent excessive strains in the pipe work. All supports shall be installed to permit the materials to contract and expand freely without putting any strain or stress on any part of the system. Provide anchors as necessary.

19.16 MEASUREMENTS

- GG. Before ordering any material or doing any work, verify all measurements at the building and be responsible for their correctness. No extra charges or compensation will be allowed on account of any difference between actual dimensions and measurements indicated. Submit any difference found to the Architect for consideration before proceeding with the work.

20.17 NOISE REQUIREMENTS

- HH. All power driven equipment shall be quiet in operation and free from vibration. All metal partitions, ducts, sheet metal housing, etc., shall be so constructed and braced that there will be no vibration or rattling when the system is in operation. Connections to equipment shall be so designed and constructed that noise and vibration will not reach the conditioned area through ducts, piping, sheet metal construction or building construction.

21.18 EQUIPMENT BASES AND VIBRATION ISOLATION

- II. Provide vibration isolation under all equipment such as pumps, blowers, air handling units, exhaust fans, etc., that have moving parts. Where suitable foundations are not detailed or specified, they shall be furnished in accordance with the manufacturer's recommendations.

22.19 ELECTRIC WIRING

- JJ. All motor starters that are included as a part of the HVAC equipment shall be furnished under this division only when required by these specifications or the drawings. All other starters shall be furnished under Division 16, Electrical. Fractional HP motors shall have internal protection. Three-phase starters shall have three leg protection.

- KK. Contractor shall verify voltage, phase, and all electrical load characteristics with the electrical contractor before ordering any equipment. The contractor shall include in his bid the cost of any additional items that will require electrical modifications to the specified equipment.
- LL. All control wiring, control conduit, controls, and relays are furnished and installed under this division. Room thermostat and control switches shall be located as shown or directed and all controls, relays, starters, and wiring shall conform to the National Electrical Code, applicable local codes and Division 16 of these specifications. All control wiring shall be installed in metallic conduit, except low voltage (less than 50v) wiring may be run in accessible concealed spaces without conduit if permitted by code. Use conduit in all inaccessible areas. All wiring drops in walls to thermostats shall be in conduit. Sensors and/or thermostats shall be mechanically mounted in a metal enclosure on an electrical j-box with a mud ring for sheet rock walls. All controls shall be furnished and properly identified with instruction for proper electrical connections. The responsibility for proper connections and operation is included under this division. All power wiring, all power conduit, and raceways shall be furnished and installed under Division 16, Electrical.

23.20 MOTORS AND DRIVE

- MM. Motors ½ HP and smaller shall be 120v single-phase. Motors ¾ HP and larger shall have phase, voltage as shown on drawings. Furnish all single-phase motors with internal over-load protection. 208v three-phase motors 50 HP and larger and 480v three-phase motors 100 HP and larger shall be suitable for star/delta or part winding type start. Provide service factor of 1.15 minimum. Size motors so that nominal capacity exceeds BHP at duty schedules. (Motors 1 HP and larger shall be high efficiency in accordance with NEMA Standard 12.6C.)
- NN. All belt drives shall be designed for 150% of motor rated HP. Drive assemblies up to two belts shall have adjustable motor sheave with midpoint of the adjustment range at rpm required for specified performance.
- OO. On drive assemblies with three belts or more, provide fixed motor sheaves for specified rpm. Furnish and install up to two pulley changes as necessary to achieve required air quantities.
- PP. All multiple belt drives shall be factory marked matched sets.
- QQ. Unless otherwise specified, all two-speed motors shall be two winding motors.

24.21 INSTRUCTIONS

- RR. Instruct the Owner in the proper operation and maintenance of the equipment. At a time designated, provide an engineer or mechanic to go over the system and the maintenance manual with the Owner's representative to thoroughly familiarize himself with the operation and maintenance of the system.

END OF SECTION

SECTION 15010

SUMMARY OF WORK FOR AIR CONDITIONING

PART 1 GENERAL

1.1 DESCRIPTION

- A. Provide all labor, materials, equipment, and services necessary to furnish and install a complete air conditioning, heating, and ventilating system, complete as indicated or specified, except as otherwise specified herein or indicated to be performed by others. The work shall include, but not be limited to, the installation and placing into operation of:

1. Removal of existing equipment and piping as specified.
2. Complete refrigerated cooling, warm air heating, and ventilation systems.
3. Complete evaporative cooler and furnace systems.
4. Complete systems of exhaust for toilet and other areas.
5. Complete make-up air system.
6. Testing, balancing, and start-up of all systems.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. The following work is included under other sections of these specifications:

1. Openings and lintels for ducts, grilles, registers, and diffusers.
2. Water and gas piping. Division 15, Sections 15600 through 15999.
 3. Electrical power wiring and disconnect switches, except as specifically required to be furnished herein. Division 16.
 4. Finish painting. Division 9.
5. Concrete. Division 3.

B. APPROVED MANUFACTURERS

1. Specification herein, by brand name, is intended to establish a standard of quality. Further, equipment specified by brand name and model number has been checked as to size and weight requirement, and space allocation has been made accordingly.

- C. Submittal of equipment by all acceptable manufacturers must be complete in every detail and must comply with space requirements, weight, complete performance data, and supplemental data requested by the Architect. Contractor shall be responsible for assurance that the equipment meets all the requirements detailed in this and other sections and indicated on the drawings. Contractor shall furnish the electrical contractor shop drawings of mechanical equipment indicating all electrical requirements.
- D. Each section includes a list of manufacturers whose equipment is acceptable as to manufacture, subject to conformance with all drawings, specifications, and addenda items. Careful checking must be made to verify that the equipment will meet all capacities, requirements, and space allocations and that the weights are not excessive.

PART 2 PRODUCTS

2.1 SUBMITTALS

- A. Submittals shall include, but not be limited to, the following:
 - B. Each type and component of air conditioning, cooling, air handling, ventilation, and heating equipment.
 - C. Automatic controls and wiring.
 - D. Grilles, registers, ceiling outlets, louvers, dampers, and access doors.
 - E. Insulation: acoustical, thermal, and finish.
 - F. Valves, fittings, strainers, piping and piping accessories including hangers and rollers.
 - G. Miscellaneous other items required by the drawings or specifications and as directed for a complete air conditioning, heating and ventilating system.
 - H. Format: Submittals shall be contained in a pdf format. Each separate section of the complete mechanical specifications shall be indexed and tabulated with an item number. If possible, one Submittal package will be submitted.
1. A cover sheet at the front of the submittal book shall list the following information:
 - Mechanical Submittal Data
 - Project Full Name, Address and Phone Number if Possible
 - Architect Full Name, Address, Phone Number and Project Engineer's Name
 - General Contractor Full Name, Address and Phone Number and Responsible Party Name
 - Mechanical Contractor Full Name, Address and Phone Number and Responsible Party Name
 - Item Number
 - Description
 - Manufacturer's Name
 - Specification Number
 - Equipment Mark and Number or Detail Drawing Number (See Project Drawings).
 - Mechanical Drawing Sheet Number (Location of Equipment)
 2. Each section of the complete mechanical specification shall have a cover sheet listing the following information:
 - Mechanical Submittal Data
 - Specification Section Number and Title
 - Project Full Name, Address and Phone Number if Possible
 - Architect Full Name, Address, Phone Number and Project Engineer's Name
 - General Contractor's Full Name, Address and Phone Number and Responsible Party Name
 - Mechanical Contractor Full Name, Address and Phone Number and Responsible Party Name
 - Suppliers Full Name, Address, Phone Number and Responsible Party Name for each Separate Supplier of the Equipment Listed in That Section
 - Equipment Mark and Number or Detail Drawing Number (See Project Drawings)
 - The Complete Material and/or Equipment Ordering Numbers Including all the Options Numbers
 - Description
 - Manufacturer
 - Model/Type/Size/Series
 - Drawing Sheet Number and Space Name or Number

- Other Technical Data Required for a Complete Description of the Item
- All exceptions to the Individual Equipment Specifications and the Reasoning for the Exceptions. Such information shall be Highlighted (Red, Yellow, Etc.)

3. Dimensional drawings (including optional accessories appropriate to this project).

4. Electrical data tables showing voltage, phase, RPM, HP, (or kw), full load (or rated load) amperes, and lock rotor amperes for each major electrical component of the equipment piece. Provide NEC ampacity (if appropriate), motor enclosure type, and required mounting position. All other descriptive information that might be needed for the individual equipment piece shall be included.

6. Mechanical Contractor shall verify voltage, phase, RPM, enclosure type and load characteristics of all the mechanical equipment with the Electrical Contractor before submitting the submittals and before ordering any equipment.

7. Capacity data tables (copies of catalog capacity tables including manufacturer's name). Fan curves for air moving devices (except propeller condenser fans). Pump curves for all pumps (including impeller size, net positive suction head and the specific gravity of the liquid being pumped).

8. Each submittal shall specifically reply to every item of the individual equipment specifications and all electrical characteristics. Such information shall be highlighted (red, yellow, etc.) in the submitted manufacturer's literature including all options.

I. Copies: Submit sufficient copies to allow for the following in addition to the copies necessary for your use:

1. Architect's copy.
2. Engineer's copy.
3. General Contractor's copy.
4. Mechanical Contractor's copy.
5. Electrical Contractor's copy.
6. Owner's copy (to be retained by the General Contractor and shall be included in the Equipment List and Maintenance Manual (See Section 15000.2).

J. The Contractor and/or equipment supplier shall include in his bid the cost of additional items that will require electrical modification to the specified equipment.

PART 3 EXECUTIONS

3.1 WORKMANSHIP

1. Install all work pertaining to water and duct systems as close as possible to layout shown on the drawings. Employ skilled mechanics to install all systems.

END OF SECTION

SECTION 15015

PRE-PURCHASED MATERIALS

PART 1 GENERAL

1.1 DESCRIPTION

- A. Installation of the pre-purchased materials specified below. Furnish and install required accessories to complete system.
- B. Contractor shall assume responsibility for executing all remaining functions of the pre-purchase purchase orders from Trane.
 - 1. Issue new purchase order(s) to vendor(s) as required. Submit these to _____ for transmission to vendor(s) with the cancellation of the pre-purchase order(s).
 - 2. Assume all further responsibility for payment of vendor invoices.
 - 3. Assume all further responsibility for coordination of delivery.

1.2 WARRANTY

- A. Contractor shall provide parts and labor warranty for all pre-purchased equipment.

1.3 ADDITIONAL REQUIREMENTS

- A. Contact vendor(s) for full disclosure of vendor terms and conditions.
- B. Install units per manufacturer's recommendations except where superseded by these specifications.
- C. Should partial payment to the vendor(s) be made prior to the award of the construction contract, the contractor shall credit the owner in that same amount.
- D. Contractor shall carefully examine the pre-purchased equipment information from the vendors listed in Paragraph 2.1. No extras or additional compensation will be permitted for the installation of pre-purchased equipment beyond the Contractor's bid price. Where the drawings or specifications require additional equipment or accessories which are not included in the pre-purchase order(s), the Contractor shall include such materials at no extra cost.

PART 2 PRODUCTS

2.1 ITEMS PRE-PURCHASED

<u>MATERIAL</u>	<u>VENDOR</u>	<u>PURCHASE PRICE</u>	<u>ESTIM. DELIVERY</u>

END OF SECTION

SECTION 15023

TESTING

PART 11111112

GENERAL

3.2 DESCRIPTION

- B. Before acceptance and final payment, demonstrate that all apparatus is functioning properly and efficiently. Balance air quantities for even temperatures throughout, adjust controls, and in general, place the system into operation.

PART 433 EXECUTION

5.4 START-UP

- D. Perform start-ups and equipment checks for the first heating and the first cooling season as part of the contract price.

6.55 BALANCING

- F. Air balancing shall be performed by an independent air balancing and testing agency certified by the AABC or NEBB. The testing agency shall be one which specializes in the balancing and testing of heating, ventilating, and air conditioning systems; to balance, adjust and test air moving equipment, and air distributing or exhausting systems as herein specified or by a NEBB certified installing contractor. All work performed by the agency shall be done under direct supervision of a qualified heating and ventilating engineer employed by them.
- G. Perform all work in accordance with the standards of the Associated Air Balance Council or NEBB manual, latest issue. It is understood that the NEBB or AABC standards may not adequately describe the detailed manner in which every situation which may be encountered in a system is to be handled. However, there shall be no deviations from the standards as they apply, directly or by implication, except by written approval by the Architect.
- H. The Contractor shall notify the Architect seven (7) days prior to the start of the system balancing so procedures can be witnessed.

END OF SECTION

SECTION 15110

DUCTWORK (Low Pressure)

PART 1 GENERAL

1.1 DESCRIPTION

- A. Provide all labor, materials, equipment, and services necessary to furnish and install all ductwork as indicated or specified.

1.2 SCOPE

- A. Provide sheet metal ductwork for all exhaust and supply and return ductwork.

1.3 APPROVED MANUFACTURERS

- A. The following manufacturers are approved for use subject to the detailed requirements of the drawings and these specifications.
 - 1. Duct Turns: Tuttle & Bailey, Duro Dyne, Barber-Colman, Elcen, Titus.
 - 3. Flexible Ductwork & Fittings: Thermaflex, Glass Insulation, Wire Mold, Clevaflex, Manville, Atco, Flexmaster.

PART 2 PRODUCTS

2.1 FABRICATION

- A. All ductwork shall be fabricated and installed by skilled mechanics in strict conformance with the latest SMACNA standards for a minimum of 2" static pressure. Install each duct system complete with all necessary ducts, fittings, turning vanes, splitter dampers and supports. At all times keep available at the job site, for reference purposes, a minimum of one SMACNA standard pertaining to the specific duct system used.

2.2 GENERAL

- A. Construct all fittings, elbows, and transitions to provide a minimum of noise and resistance. Where space permits, radius elbows shall have a minimum centerline radius of 1-1/2 times the width or depth. Square elbows shall have square throat and square heel with single thickness turning vanes. Transitions must be gradual with changes not to exceed 1" in 3.5". Provide opposed blade dampers with manual operators down stream of all duct splits not shown to have beveled branches or terminal devices.
- B. Paint all ductwork, turning vanes, insulation, etc., visible through grilles, registers, or ceiling diffusers flat black.

2.3 SHEET METAL DUCTS

- A. Fabricate all sheet metal ducts of prime grade, lock forming quality galvanized steel sheets using gauges of metal and reinforcing between joints in accordance with the SMACNA HVAC Duct Construction Standards - latest issue. Pressure class shall be as indicated on the duct material schedule on the project drawings. Duct joining system by Ward Duct Connection Inc. with 20 GA metal cleats is an acceptable method for connecting ductwork.

END OF SECTION

SECTION 15130

DUCTWORK ACCESSORIES

PART 1 GENERAL

2.1 DESCRIPTION

- A. Provide all labor, materials, equipment and services necessary to furnish and install all ductwork and accessories as indicated or specified.

3.2 APPROVED MANUFACTURERS

- B. The following manufacturers are approved for use subject to the detailed requirements of the drawings and these specifications:
 - 1. Grilles, Registers, Diffusers: Titus, LSI/Krueger, Anemostat, Carnes, Metal-Aire, Hart & Cooley.
 - 2. Fire Dampers: Air Balance, Fire Seal, Ruskin, Tuttle & Bailey, Phillips, Prefco, Safe Air Inc., Greenheck.
 - 3. Louvers and Dampers: DOWCO, Airstream, Airolite, Air Balance, Inc., Ruskin, Air Louvers, Inc., Louvers & Dampers, Inc., Metal Form, Carnes, Pottorff, Prefco, Safe Air Inc., Greenheck, EMPCO.
 - 4. Manual Dampers: Round Manual Balancing Damper: Ruskin MDRS type or equal, Greenheck, EMPCO.
 - 5. Damper Quadrants: Vent Fabrics, Elcen, Duro.
 - 6. Relief and Intake Roof Housings: Penn, Western, Ammerman, Carnes, Acme, Greenheck.

PART 4 PRODUCTS

5.3 FIRE DAMPERS

- C. Furnish and install fire dampers and ceiling dampers, including their sleeves and access doors, in accordance with the conditions of their listing, NFPA 90A, UL 555 (standard for fire dampers and ceiling dampers, most current edition), and the manufacturer's installation instructions. Access doors shall be labeled "Fire Damper". Fire dampers shall be dynamic rated.

6.4 GRILLES, REGISTERS, DIFFUSERS

- D. Grilles, registers, and diffusers shall be of the size and model indicated.
- E. Dampers, Equalizing Grids, and Gasketing: Provide dampers and equalizing grids at all diffusers and all supply, exhaust and return registers with dampers, all painted flat black. Provide neoprene gasketing around the inside of the frame of all units.
- F. Installation: All grilles, registers, and diffusers shall be set flush and true to the wall or ceilings to prevent air leakage around the edges. Provide plaster frames for all outlets in plaster or gypsum board.
- G. Extractors: Provide extractors behind all diffusers, grilles and registers with right angle takeoffs. Extractors may be used in lieu of equalizing grids at these places.

- H. Finish: All units must be factory finished. Provide finish and color as directed by Architect.

7.5 LOUVERS

- I. Furnish and install all fresh air intake louvers, exhaust air, relief air and make-up air louvers as indicated on the drawings and specified herein.
- J. Steel:
 - 7. Louver: Z type, 4" deep, equal to Airolite type 638, all 16 gauge galvanized steel construction. Finish and color as selected by Architect. Frame as required.
 - 8. Screen: 1/4" x 1/4" galvanized iron mesh in removable galvanized sheet metal frame.
- K. Aluminum:
 - 9. Louver: Z type, 4" deep, 0.080" (0.125") thick, extruded aluminum blades and frame, equal to Airstream, Model ASA, clear anodized finish, frame as required.
 - 10. Screen: 1/4" expanded aluminum in extruded aluminum, removable frame.

8.6 RELIEF AND INTAKE AIR ROOF HOUSING

- L. Furnish and install all relief and intake air roof housing where indicated, complete with all raised curbs, flashing, and backdraft dampers. (See drawings for additional details).
- M. Housings: Housings shall be aluminum construction equal to Penn Ventilator Co. Airette of sizes indicated on the drawings.
- N. Birdscreen: Provide 1/4" x 1/4" galvanized iron mesh birdscreen.
- O. Testing: Manufacturer's catalog ratings must be based on tests conducted in an industry approved testing laboratory with air volumes and losses indicated. Submit all data for approval. Outlet and inlet areas shall not be less than the units shown on the drawings.

9.7 BAROMETRIC DAMPERS

- P. Furnish and install barometric dampers in the neck of all relief air penthouses and elsewhere as indicated on the drawings.
- Q. Metal:
 - 11. Construction: Aluminum construction set in a steel channel frame equal to Metal Form MFS-47 with dampers to swing out. Provide counter balance system.
 - 12. Dampers: Mechanically attached felt edges, channel frame, to be painted with a minimum of two coats of flat black enamel.
- R. Fabric:
 - 13. Construction: .05" galvanized steel frame, 3" wide with angled galvanized steel wire mesh. Metal Form SO-65 or equal.
 - 14. Dampers: Neoprene coated fiberglass fabric, mechanically adhered to mesh and frame.

10.8 MANUAL DAMPERS

- S. Furnish and install manual dampers where indicated on the drawings, Metal Form OBD-11 or equal.
- T. Opposed blade type, maximum blade width 8", 0.05" galvanized steel channel frame.
- U. Teflon or brass bearing bushings.
- V. Manual quadrant with locking device.
- W. Round manual balancing damper: Frame shall be of galvanized steel, minimum 20 GA, with 3/8" square axle shaft extending beyond frame through factory mounted, locking hand quadrant, bearings molded synthetic. Maximum velocity shall be 1500 FPM to be used especially for manual balancing applications within round spiral ductwork.

END OF SECTION

SECTION 15150

CONDENSATE AND EQUIPMENT DRAIN SYSTEMS

PART 1 GENERAL

2.1 DESCRIPTION

- A. Work Included: Provide all labor, materials, equipment and services necessary to furnish and install all drain piping from cooling coil and mechanical equipment drain pans to the nearest floor sink, or as otherwise indicated, complete with all connections to the air handlers and equipment, traps, fittings, etc. Where required by code provide overflow drains and venting to atmosphere. Provide insulation on primary condensate drain pipe.

3.2 TESTING

- B. Test by filling to the highest point of each system and hold for four (4) hours. Repair all leaks, replace all defective piping, and re-test as required.

PART 4 PRODUCTS

5.3 MATERIALS

- C. Condensate drain system shall be galvanized steel, or copper.
1. Provide dielectric unions at connections of dissimilar metals.
- D. Piping:
2. Copper: Type M hard drawn, conforming to ASTM B-88-72 above ground, and Type "L" below ground.
- E. Fittings:
3. Copper: Wrought copper conforming to ANSI A40.2.
- F. Solder: 50/50 solder with suitable flux.

6.4 PIPE HANGERS AND SUPPORTS

- G. General: Adequately support piping against sagging, pocketing, swaying, and displacement. Properly space and apply hangers to achieve the result, and not farther apart than the following:
4. Copper Tubing
- | | |
|------------------|-------------------|
| 3/4" and smaller | 6 foot on center |
| 1" and 1-1/4" | 8 foot on center |
| 1-1/2" and 2" | 10 foot on center |
| 2-1/2" thru 4" | 12 foot on center |
- H. Size all hangers on insulated lines to fit around outside diameter of insulation specified with allowance for F & M Fig. 81 galvanized sheet metal shield.
- I. Pipe Hangers:
5. Trapeze Hangers: Use channel supported from structure with full threaded rod. Space hangers for smallest pipe in the group from the schedule above.

6. Pipe Supported From Wall: Use hanger supported from F & M Fig. 151 wall bracket.
7. Piping Vertical: Secure with F & M Fig. 238 riser clamp for uninsulated pipe.
8. Single Pipe Hanger: Use F & M Fig. 199 adjustable split ring swivel hanger supported from structure with full threaded rod for uninsulated pipe and F & M Fig. 800 with insulation shield for insulated pipe.
9. Install "Stoneman" trisolators to isolate all uninsulated copper piping.

7.5 PIPING INSULATION

- J. Insulate all primary condensate drain piping with 3/8" thick flexible foamed plastic closed cell pipe insulation, "K" factor of not more than .26 at 70°F, ASTM C177-63 and ASTM C355-64 water method.
- K. Install insulation by slitting tubular sections and applying over piping or sliding the tubing, unslit, over the end of the piping. Fabricate mitercut covers for fittings from insulation in conformance with manufacturer's recommendations. Seal joints butt ends with fire retardant, water-proof adhesive equal to Armstrong 520. (Taped joints will not be accepted.)

PART 8 EXECUTION

9.6 INSTALLATION

- L. Install piping free of dips and sags, pitching minimum 1/8"/ft. wherever possible but not less than 1" in 10 feet if approved by the building official. Provide traps and vents at equipment connections. Provide WYE fittings with threaded caps at all changes in direction. Provide cleanouts at 50 feet on center for straight runs of piping. All piping below floor slab or below grade shall be copper. All piping below slab on grade or thru slab on grade shall be wrapped with 20 mil thick polyethylene tape with a minimum of 50% overlap.
- M. Condensate drain size shall be not less than the connection size of the equipment served.

END OF SECTION

SECTION 15210

AIR CONDITIONING UNITS (Packaged Gas Heating, Electric Cooling)

PART 11111112 GENERAL

3.2 DESCRIPTION

- B. Provide all labor, materials, equipment and services necessary to furnish and install packaged gas heating and electric cooling units in one weathertight insulated casing, factory assembled and tested and designed for the use intended. Provide furnace section, indoor blower and coil, compressor, outdoor fan and coil, crankcase heater and control panel in a single unit.

4.33 APPROVED MANUFACTURERS

- D. The following manufacturers are approved for use subject to the detailed requirements of the drawings and these specifications.

- 2. Air Conditioning Units: Trane per Embry Riddle

PART 5453 PRODUCTS

6.5 FURNACE SECTION

- F. Horizontal gas fired with automatic and safety controls, approved by AGA for the service intended with manual gas valves, pressure regulator, burner controls, 100% safety pilot, automatic ignition fan and high limit combination switch. Provide down draft diverter and flue cap or blower induced combustion air.

7.67 GAS PRESSURE REGULATOR EQUIPMENT

- H. Provide Fisher series S-100 or S-200 diaphragm actuated pressure regulator suitable for natural gas or propane service. Each orifice shall be sized to regulate the required cubic feet per hour at the gas service pressure being furnished to the equipment. Provide outlet pressure as required by the equipment manufacturer's specifications for each installed unit. Install the above item if it is not furnished in other sections of the specifications and/or drawings or if the gas service pressure exceeds the unit manufacturer's inlet pressure specifications.

8.79 HIGH ALTITUDE OPERATION (ABOVE 3000' ELEVATION)

- J. The equipment shall be de-rated as per manufacturer's recommendations to achieve the highest combustion efficiency possible which attains complete combustion with a minimum of excess air, CO and smoke with the minimum of attention and to meet the governing agency codes or guidelines.

9.811 COOLING COIL

- L. Factory built complete with refrigerant direct expansion cooling coil, expansion valve (capillary acceptable on 61,000 Btu/H per circuit and smaller), insulated casing and insulated drain pan.

10.913 INDOOR FAN SECTION

- N. Centrifugal type. Belt drive with adjustable sheave. Direct drive with two-speed motor acceptable on units nominal 3 tons and smaller.

11.1015FILTERS

- P. 1" thick, throwaway type. See "Filters" section. Contractor shall be responsible for making sure there is adequate space to install filters.

12.1117CONDENSING SECTION

- R. Hermetic type compressor and motor, air cooled finned tubed condenser, condenser fans, refrigerant piping, electrical control panel and all necessary starters, transformers, relays, high pressure switch and low pressure switch. Provide wire coil guard.

13.1219CONTROLS AND POWER WIRING

- T. The controls shall include a low voltage room thermostat with a fan "on-auto" switch and a system "heat-off-cool" switch. Each unit shall be completely factory wired for terminal connections of thermostat and power wiring.
- U. Provide one power connection point for all electrical wiring.

14.1322EFFICIENCY

- W. The certified ARI capacities of the equipment shall indicate an SEER of not less than the following at ARI conditions:

Under 65,000 Btu/h total capacity----- 16.0 SEER

65,000 Btu/h and greater total capacity----- 11.1 EER

15.1424ECONOMY CYCLE

- Y. Small units (under 65,000 Btu/H total capacity, ARI): Automatic 100% outside air system with controls, outside air intake and relief dampers and weatherproof louvers or hoods with screens. Provide override humidistat or enthalpy control and weatherproof housing. Relief side pressure drop thru unit at specified CFM shall not exceed 0.03" WG.

16.1526EQUIPMENT START-UP

- AA. Provide an authorized manufacturer's service representative for start-up. The service representative shall furnish a complete start-up report, including a Combustion Test Report, and other information that is needed to see that the unit is operating as per manufacturer/design specifications.

END OF SECTION

SECTION 15320

EXHAUST FANS

PART 1 GENERAL

2.1 DESCRIPTION

- A. Provide all labor, materials, equipment, and services necessary to furnish and install exhaust fans and blowers.

3.2 APPROVED MANUFACTURERS

- B. The following manufacturers are approved for use subject to the detailed requirements of the drawings and these specifications.

- 1. Exhaust Fans: Penn Ventilator Co., Greenheck, Cook, Broan,

PART 4 PRODUCTS

5.3 GENERAL

- C. Provide roof caps, wall caps, flashings, and bases for all fans as indicated and/or as required. Provide speed switches, integral inlet grilles, and duct connections as indicated or specified.
- D. Provide internal disconnecting means and overload protection on all units 1/2 HP and smaller and/or 120 volt, single phase.
- E. Provide exhaust fans with approved vibration isolators as indicated or specified.
- F. All belt driven exhaust fans shall have adjustable motor pulleys for fan speed control. Rate belts for 150% of motor rated HP.
- G. All fans, except toilet exhaust fans 200 CFM and below, shall be AMCA certified and approved.
- H. Provide speed switches for all multi-speed fan motors. Two-speed motors shall be two winding type.
- I. Sound levels shall not exceed those indicated.

6.4 ROOF EXHAUST FANS

- J. Centrifugal roof exhauster with spun aluminum housing.
- K. Fan wheel shall be of centrifugal design statically and dynamically balanced.
- L. Fans shall have integrally formed base to fit on factory-fabricated curbs.
- M. Housings shall have wiring channel. Housing shall have direct discharge design with birdscreen over opening.
- N. Motor and fan assembly shall be on neoprene vibration isolation mountings.
- O. Fans shall be belt driven with adjustable sheaves. Belt drive shall be rated for 150% of rated motor horsepower and selected for midpoint of the adjustment range.

END OF SECTION

SECTION 15330

FILTERS

PART 1 GENERAL

2.1 DESCRIPTION

- A. Provide all labor, materials, equipment and services necessary to furnish and install all filters, complete with all frames, mounting hardware, and accessories as indicated or specified.

3.2 APPROVED MANUFACTURERS

- B. The following manufacturers are approved for use subject to the detailed requirements of the drawings and these specifications.
- C. Filters: AAF, Farr, Cambridge, Continental, MSA, Trion, Cosatron.

PART 4 PRODUCTS

5.3 DISPOSABLE (FIBERGLASS)

- D. Filter: Viscous impingement, replaceable type, continuous filament, glass media pad with a thermosetting bond and sprayed with nonflammable spray. Pad shall be contained in each side by an open metal grille bound into a rigid cardboard frame, 1" thick except as otherwise noted.
- E. Efficiency: 78% of minimum average efficiency for 1" thick media by the AFI (Air Filter Institute) artificial dust test method. Initial pressure shall not exceed 0.10" WG at 500 FPM. Size filters for a maximum of 350 FPM, except as otherwise indicated.
- F. Holding frames: Mount filters in channel frame in unit or in external filter rack as indicated on the drawings. Provide hinged access door with latch for filter removal. Panels with sheet metal screws will not be acceptable.
- G. Temporary Filters: Provide temporary filters for use during construction. Upon completion of the project and prior to final acceptance, replace all disposable filters with new filters.

6.4 REPLACEABLE MEDIA

- H. Filter: Viscous impingement, continuous filament, glass media pad thermosetting bond and sprayed with a nonflammable spray. Renewable pad shall be housed in galvanized steel holding frame with galvanized rod or 14 gauge galvanized expanded steel retainers on both faces, reinforced, and easily accessible for replacement.
- I. Efficiency: 30% minimum average efficiency for 2" thick media by NBS atmospheric discoloration method. Initial pressure shall not exceed 0.20" WG at 500 FPM. Size filters for a maximum of 300 FPM except as otherwise indicated.
- J. Holding Frame: Mount filters as pre-filters in side accessible filter.
- K. Temporary Filters: Provide temporary filters for use during construction and balancing. Upon completion of the project and prior to final acceptance, replace all disposable media with new media.

7.5 MEDIUM EFFICIENCY "SACK"

- L. Filter: Strainer type media in disposable metal holder, 24" x 24" x 12" inflated depth, self-supporting media or independent support frame. AAF 2530 or equal.

- M. Efficiency: 30% average on AFI atmospheric dust spot test. Initial resistance 0.35" WG, final resistance 0.75" WG with not less than 1200 gram holding capacity.
- N. Holding Frame: 16 gauge galvanized or bonderized steel with gaskets and hold down devices.
- O. Temporary Filters: Provide temporary filters for use during construction and balancing. Upon completion of the project and prior to final acceptance, replace all filters units with new units.

8.6 SIDE ACCESS FILTER RACK

- P. Packaged factory fabricated housing for pre-filter and medium efficiency filter specified above, accessible from the side, AAF ServiSide or equal.
- Q. Heavy galvanized steel construction with 4" wide bolted flanges, heavy duty door - 180 degree hinge, neoprene gasket, quick acting spring loaded cast aluminum latches. Door designed for 3" WG differential.
- R. Polyseal, PVC wipe gaskets continuous in extruded aluminum filter holding tracks.

9.7 ELECTROSTATIC AGGLOMERATOR

- S. Filter: Electrostatic agglomerator section set inside a viscous impingement roll type filter section; complete unit shall be UL listed.
- T. Agglomerator: Aluminum elements on heavy duty insulators. Remote power pack with 12 KV for ionizing section and 3.8 KV precipitator section. Furnish wiring between power pack and agglomerator
- U. Collector: Vertical automatic roll type down stream of agglomerator 1/6 HP motor with gear drive auto- sensor control, media run out switch, metering switch. Media 65' long roll completely enclosed with hinged front access cover, 2" thick gradually increasing density. Reinforce leaving side of filter with steel wire. Provide spare roll of media to Owner.
- V. Efficiency: 85% minimum efficiency, atmospheric dust spot test, average pressure drop 0.50" WG.

10.8 BYPASS CARBON

- W. Filter: 20 gauge epoxy coated galvanized stub casing, 3" deep activated carbon fill in 26 gauge perforated tubes.
- X. Efficiency: 30% bypass efficiency, carbon, tet. carbon capacity of 24 x 24 unit minimum 9.4 lbs. according to MIL Spec. C-17605B.
- Y. Capacity: 24 x 24 cell shall be capable of 1000 CFM with 0.05" pressure drop.

11.9 HEPA

- Z. Filter: Disposable cell type high density media, sub-micron glass fibers with high tensile strength. Corrugated aluminum separators, fire retardant plywood frames, rubber bond adhesive seal, and neoprene gasket.
- AA. Efficiency: 99.97% DOP using .3 micron particles as per MIL-STD-282. Maximum initial pressure drop 1.0", nominal 12" deep.
- BB. Holding Frames: AAF model C or equal 16 gauge, 8" deep with extensions and wing nut fasteners, minimum four per filter. Bolt frame sections together.

12.10 HIGH EFFICIENCY CELL

- CC. Filter: High efficiency, disposable cell type, glass media, draft or aluminum corrugated separators, glass packing sealant, 1/8" fire retardant hard board sides with edges and corners of galvanized steel, 3/4" galvanized steel header and 1/2" galvanized steel media retaining flanges on both faces with cross bracing.
- DD. Efficiency: 84% mean with dust-spot atmospheric test. Maximum 0.53" initial static pressure with 2000 CFM on 24" x 24" x 12" cell. Minimum dust- holding capacity of 1400 grams of NBS Cotrell precipitate with 4% lintars at a final static of 0.73".
- EE. Holding Frames: 16 gauge galvanized or bonderized steel with gaskets and hold down devices. Provide integral frame for 2" pre-filter designed to permit replacement of the pre-filter without breaking seal on high efficiency filter.

13.11 DISPOSABLE (STRAINER FABRIC)

- FF. Filter: Disposable pleated media in reinforced cardboard casing.
- GG. Efficiency: 30% mean atmospheric dust-spot test. Maximum 0.2" initial static pressure with 2000 CFM on 24" x 24" x 2" cell.
- HH. Holding Frame: In combination with high efficiency filter or independent frame as shown on the drawings. Independent frames shall be 16 gauge galvanized or bonderized steel with neoprene seal.
- II. Temporary Filters: Provide one set of filters for use during construction. Upon completion of project and prior to final acceptance, replace all filters with new filters.

14.12 METAL CLEANABLE

- JJ. Filter: High velocity, galvanized steel or aluminum pad, cleanable type with galvanized steel frame all around.
- KK. Efficiency: 73% for 2" media by the AFI (Air Filter Institute) artificial dust test method. Initial pressure shall not exceed .10" WG at 500 FPM. Size filters for a maximum of 500 FPM, except as otherwise indicated.
- LL. Holding Frames: Mount filters in a channel frame in unit or in holding frames in plenums or ductwork as indicated. Holding frames shall be 16 gauge galvanized steel with felt or neoprene seal between filter and frame. Provide blanking panels in plenums where required and seal all around filter bank. Provide a hinged access door with hatch for filter removal. Panels using sheet metal screws will not be acceptable.
- MM. Cleaning: Clean and oil filters within one week after final acceptance of building or area served by units.

15.13 AUTOMATIC ROLL FILTER

- NN. Filter: A viscous impingement roll type filter section. Complete unit shall be UL listed.
- OO. Efficiency: 85% minimum efficiency, artificial dust test, average pressure drop 0.50" WG.
- PP. Housing and Control: Horizontal automatic roll type with reinforced sheet metal housings for dirty and clean rolls with access doors. Motor with gear drive, auto-sensor control or packaged combination of fan interlock, timer metering switch control, pressure switch control and timer with pressure switch override to provide comparable function to auto-sensor. Provide meter run-out switch and metering switch.
- QQ. Temporary Filters: Provide one complete set of spare roll media for all filter sections.

END OF SECTION

SECTION 15510

AUTOMATIC TEMPERATURE CONTROLS (Electric)

PART 11111112

GENERAL

3.2 DESCRIPTION

- B. Provide all labor, materials, equipment, and services necessary to furnish and install a complete system of electric temperature control. System shall be designed by and installation supervised by regularly employed representatives of the temperature control equipment manufacturer.

4.33 APPROVED MANUFACTURERS

- D. The following manufacturers are approved for use subject to the detailed requirements of the drawings and these specifications.

- 2. Automatic Temperature Controls: Trane #TCONT 800

PART 5453 PRODUCTS

6.5 WIRING

- F. All power wiring associated with the temperature control system shall be furnished and installed under Division 16, Electrical.
- G. All control wiring and conduit shall be a part of this section.
- H. Provide complete diagrams for all wiring associated with the temperature control system.
- I. Furnish and mount all switches, solenoids, interlock relays, time clocks, etc., required for the proper operation of the automatic temperature control system.
- J. All wiring shall be furnished and installed in accordance with the NEC and shall be in conduit.

7.611 TRANSFORMERS

- L. Furnish and install line to control voltage transformers as required to serve all control equipment.

8.713 EQUIPMENT

- N. Room Thermostats: Room thermostats shall be of the single temperature, fully proportioning type. All thermostats shall have concealed set point, adjustable from 55 degrees F to 85 degrees F.
- O. Temperature Transmitter: Temperature transmitters shall be of the fixed-range, direct acting, and proportional type with 8' averaging element.
- P. Valves: Control valves 2" or smaller shall have threaded end. Modulating water valves shall have equal percentage characteristics and stainless steel stems. All valve bodies shall be rated for pressures up to 125 psi. Control valves shall be sized for a maximum pressure drop of 4 psi on chilled water, 3 psi on heating water. All temperature control valves shall be furnished by the temperature control manufacturer for installation under Division 15, Mechanical, under the supervision of the temperature control manufacturer.

- Q. Valve and Damper Operators: All valve and damper operators shall be sized to provide proper operation of their respective valves or dampers.

9.818 INSTRUMENTS AND CONTROL IDENTIFICATION

- S. Identify all panel-mounted instruments and controls with engraved bakelite nameplates permanently affixed to panelboard.
- T. Identify all damper motors and automatic valves, flow switches, pressure switches, etc., with embossed aluminum or plastic tape, affixed to controller indicating service and, where applicable, normal setting.

END OF SECTION

SECTION 15540

VIBRATION ISOLATION

PART 1 GENERAL

2.1 DESCRIPTION

- A. Provide all labor, materials, equipment and services necessary to furnish and install foundation and vibration isolation supports and bases under all equipment as indicated or specified. Provide vibration isolation under all equipment such as blowers, air handling units, exhaust fans, etc. that have moving parts.

3.2 GENERAL

- B. Vibration isolation shall be properly loaded and installed in accordance with manufacturer's recommendations.
- C. Where vibration isolation is not indicated or specified, provide supports and bases as recommended by the manufacturer of the equipment.

4.3 APPROVED MANUFACTURERS

- D. The following manufacturers are approved for use subject to the detailed requirements of the drawings and these specifications.
 - 1. Vibration Isolation: Mason Industries, Vibrex, Korfund, Vibration Mountings, Inc., Amber-Booth, Vibration Eliminator Co., Vibration Isolation Co., Inc., Peabody Noise Control.

PART 5 PRODUCTS

6.4 PIPING

- E. Suspend all piping in each equipment room on Mason Industries Type HD neoprene vibration isolators. Provide type TDNHS combination spring and DD neoprene isolators for a minimum of 2 hangers at all piping connected to rotating equipment such as pumps, air handlers, etc.

7.5 AIR HANDLING UNITS (FLOOR MOUNTED):

- F. Mount on Mason Industries, Inc., model SLF spring type isolators with 1/4" thick neoprene pads. Minimum static deflection is 1".

8.6 AIR HANDLING UNITS (SUSPENDED)

- G. Mount with Mason model HS spring type isolators. Minimum 3/4" static deflection.

9.7 FAN COIL UNITS

- H. Suspend with Mason model HD neoprene hangers or Mason ND neoprene mountings. Minimum static deflection 1/2".

10.8 PACKAGED AC UNITS, BASE MOUNTED BLOWERS, MAKE-UP AIR UNITS AND EXHAUST FANS

- I. Mount on Mason ND neoprene mountings. Minimum static deflection of 1/2".

END OF SECTION

SECTION 15571
DUCT INSULATION

PART 1 GENERAL

2.1 DESCRIPTION

- A. Provide all labor, materials, equipment and services necessary to insulate all ductwork and plenums complete as specified. All insulation shall be furnished and installed by a licensed, approved insulation contractor. Acoustical duct insulation may be applied by the contractor's personnel.

3.2 APPROVED MANUFACTURERS

- B. The following manufacturers are approved for use subject to the detailed requirements of the drawings and these specifications.
 - 1. Insulation: Certain Teed, Owens-Corning, Manville, Knauf.

PART 4 EXECUTION

5.3 ACOUSTICAL INSULATION

- C. All sheet metal duct as follows:
 - 2. Scope and Thickness:

All sheet metal supply, return and outside air ductwork--1".

All ductwork exposed to weather (other than exhaust)--1-1/2".
 - 3. Material: Minimum 1-1/2 lb. neoprene or heavy density coated fiberglass duct liner suitable for velocities up to 4,000 FPM complying with NFPA 90A.
 - 4. Application: Coated duct liner shall be cut to assure overlapped and compressed longitudinal corner joints. Apply liner with coated surface facing the air stream and adhered with 90% coverage of fire retardant adhesive. The leading edge of the duct liner shall be protected with a sheet metal nosing. The nosing shall be of a Zee or Channel profile and securely fastened to the ductwork. The nosing may be an integral part of the duct. Coat all transverse joints with fire retardant adhesive. The liner shall be additionally secured with mechanical fasteners, which shall compress the duct liner sufficiently to hold it firmly in place as follows:
 - 5. Installation for velocities to 2,000 FPM: Fasteners shall start within 3" of the upstream transverse edges of the liner and 3" from the longitudinal joints and shall be spaced at a maximum of 12" o.c. transversely around the perimeter of the duct, except that they may be a maximum of 12" from a corner break. Elsewhere, they shall be a maximum of 18" o.c. except that they shall be placed not more than 6" from a longitudinal joint of the liner nor 12" from a corner break. Coat all exposed joints and edges of transverse joints with a fire retardant adhesive. Break acoustical insulation at fire dampers and provide metal nosing at exposed edge.
 - 6. Installation for velocities from 2,000 to 4,000 FPM: Fasteners shall start within 3" of the upstream transverse edges of the liner and 3" from the longitudinal joints and shall be spaced at a maximum of 6" o.c. transversely around the perimeter of the duct except that they may be a maximum of 6" from a corner break. Elsewhere, they shall be a maximum of 16" o.c., except that they shall be placed not more than 6" from a

longitudinal joint of the liner nor 12" from a corner break. In addition to the adhesive edge coating of transverse joints, any longitudinal joints shall be similarly coated with adhesive.

6.4 THERMAL INSULATION

- D. Scope: Insulate all cooling and heating ductwork on roof.
- E. Thickness:
 - 7. Outdoors: 2" thick.
 - 8. Indoors: 1" thick.
- F. Exposed Rectangular:
 - 9. Material: CSG Group IB 600, 6 lbs/cu.ft. Fiberglass insulation board having a k-value of 0.22 at 75 degrees F mean temperature with FSK vapor barrier jacket.
 - 10. Application: Insulation shall be fastened to duct with mechanical fasteners. Fasteners shall be spaced 12" to 18" on center with a minimum of two rows per side of duct. Secure insulation in place with washers firmly embedded in insulation. Seal all joints, breaks, and punctures with fire retardant vapor barrier adhesive reinforced with a 3" wide vapor barrier strip similar to that of facing.
- G. Exposed to Weather: Insulate as specified above and, in addition, apply coat of weatherproof mastic and embed into wet tack coat a layer of open weave glass cloth. Smooth membrane to avoid wrinkles and overlap all seams at least 2". Apply finish coat of same type mastic. The total thickness of coating shall be a minimum of 1/8".

END OF SECTION

SECTION 15600

COMMON REQUIREMENTS FOR PLUMBING WORK

PART 1 GENERAL

2.1 DESCRIPTION

- A. Provisions of this Section apply to all work specified in all sections 15601 thru 15790.
- B. In addition, work in these sections are governed by all provisions of the Contract Documents.

3.2 SUBMITTALS

- C. Submit shop drawings and all data required in accordance with detailed requirements of Division 1, General Requirements, for all work provided under Division 15. Refer to Section, Summary of Work for Plumbing, for required submittals.

4.3 RECORD AND AS-BUILT DRAWINGS

- D. Provide record drawings which shall clearly show all differences between the contract work as drawn and installed. Piping below slab and/or grade and all piping which is not accessible after construction shall be dimensioned from columns or any permanent structure. Also, show all work added to the contract which is not shown on the contract drawings.
- E. Maintain a set of marked drawings at the job site. These shall be kept legible and current and shall be available for inspection at all times by the Architect. Show all changes in the contract work, or work added, on these Record Drawings in a contrasting color.
- F. Upon substantial completion of the work, transfer the information from the marked drawings at the site to the Record Drawings as reproducible sheets which the contractor shall obtain from the Architect.
- G. Provide record drawings and as-builts in accordance with Division 1, General Requirements.

5.4 WARRANTY

- H. Warrant the system, labor, materials and equipment for one (1) year after completion and acceptance, except as specified for a longer period elsewhere. Replace or repair all defective workmanship, equipment, and materials at no additional cost to the Owner.

PART 6 PRODUCTS

7.5 EQUIPMENT LIST AND MAINTENANCE MANUAL

- I. Prior to completion of the job, the Contractor shall compile a complete equipment list and maintenance manual. The equipment list shall include the following items for every piece of material and equipment supplied under this section of the specifications:
 - Ψ Name, model and manufacturer
 - Ψ Complete parts drawings and list
 - Ψ Local supply for parts or replacement with address and telephone numbers
 - Ψ Local service organization for equipment with address and telephone numbers
 - Ψ All tags, inspection packages, inspection slips, etc., removed from equipment as shipped from the factory
- J. Maintenance manual shall include all available manufacturers' operation and maintenance instructions together with the Record Drawings hereinbefore specified and all other diagrams and instructions necessary to properly operate and maintain the equipment. The manual shall also include the name, address, and phone number of the general contractor and all subcontractors involved in any of the work specified herein. The equipment list and

maintenance manual shall be submitted in accordance with Division 1, General Requirements.

8.6 REGULATIONS, PERMITS, AND INSPECTIONS

- K. Regulations: All materials, equipment and installation must comply with all applicable codes, rules, and regulations, all of which must be considered a part of these specifications.
- L. All electric operated equipment shall be listed and/or bear the label of a nationally recognized laboratory such as FM, UL, CSA, ETL, MET, ARL, or as required by the authority having jurisdiction.
- M. Permits: Obtain and pay for all permits and licenses required, including water and sewer development fees.
- N. Inspections: All work must be inspected and approved by local authorities.
- O. Prior to final approval, furnish the Architect certificates of inspections and approvals by the local authorities.

PART 9 EXECUTION

10.7 EXCAVATION AND BACKFILL

- P. Perform all necessary excavation, shoring and backfilling required for the proper laying of all pipes inside the building and premises, and outside as may be necessary and in accordance with OSHA requirements. Conform to the section titled "Earthwork". Remove all excess excavated materials from the site or dispose of on site as directed.
- Q. Excavate all trenches open cut, keep trench banks as nearly vertical as practicable and sheet and brace trenches where required for stability and safety. Excavate trenches true to line and make bottoms not less than 18 inches wide but no wider than necessary to provide ample work room. Grade trench bottoms accurately to provide uniform bearing and support for each section of pipe on undisturbed soil along its entire length. Dig 'bell' holes after the trench bottom has been graded. Machine grade to 6 inches below bottom of pipe and fill with sand to bottom of pipe. Do not cut any trench near or under footings without first consulting the Architect. Comply with OSHA requirements.
- R. Provide backfilling and compaction in accordance with requirement of the section titled "Earthwork" and under the direction of the Architect to the required density. Make the first 2 feet of fill in 6 inch layers, each thoroughly compacted as directed, and free from rocks, large clods of earth, leaves, branches, and debris. Compact the rest of the backfill as directed, using in the backfill no rocks larger than 10 inches in diameter, and using no rocks at all in the top 12 inches.
- S. No work shall be covered until properly tested and approved. All pavement, sidewalk, piping, electrical conduit, etc., caused to be cut or damaged by this section shall be restored to original condition by workmen qualified and active in the trades involved.

11.8 DRAWINGS

- T. The drawings show the general arrangement of all plumbing work. It is not the intent of the drawings to indicate all offsets, bends, etc. that may be required to accommodate the actual project conditions. The contractor shall familiarize himself with all the contract documents prior to bidding, and include in his bid the required labor and materials. Should conditions require any rearrangement to suit the design of equipment, structure, or piping furnished, submit working drawings showing in detail and schematic all changes necessary for proper operation of the system.
- U. Should the particular equipment he proposes to install require other space conditions than

those shown on the drawings, the Contractor must arrange for such space before submitting his bid. Any changes which become necessary on account of failure to comply with this paragraph shall be made at the Contractor's expense.

- V. The Contractor and Subcontractors shall be held to have familiarized themselves with all of the drawings, all of the specifications, and the work of other trades, and crafts which might affect the installation of this work. This work shall be installed without interfering with any other work by cooperation with the workmen of all other trades and crafts. The Contractor shall familiarize himself with the architectural drawings which indicate items that shall be roughed-in, connected, etc.

12.9 ACCESSIBILITY

- W. Unions, valves, controls, etc., shall not be placed in any pipe line at a location that will be inaccessible after the system is complete.
- X. All valves, motors, bearings, controls and other apparatus which must be located in an inaccessible location shall be provided with suitable access doors or covers (fitted in a framed opening) which will permit proper operation and servicing of the apparatus.

13.10 PROTECTION OF APPARATUS

- Y. At all times, take such precautions as are necessary to protect the apparatus from damage caused by theft, the weather, and all building operations. Failure to protect the material and apparatus adequately to the entire satisfaction of the Architect shall be sufficient cause for the rejection of any damaged material or equipment. All pipe and equipment openings shall be closed to prevent obstruction and damage.

14.11 CONTRACTION AND EXPANSION

- Z. Install all work in such a manner that its contraction and expansion will not do any damage to the pipes, the connected equipment, or the building. Install off-sets, swing joints, expansion joints, etc., as required to prevent excessive strains in the pipe work. All supports shall be installed to permit the materials to contract and expand freely without putting any strain or stress on any part of the system. Provide anchors as necessary.

15.12 SLEEVES AND PLATES

- AA. Furnish and locate all sleeves and inserts required before the floor and walls are built, or be responsible for the cost of cutting and patching required for pipes where sleeves and inserts were not installed, or where incorrectly located. Where sleeves are located in pre-cast members, provide the pre-casting fabricator detail shop drawings and/or templates for openings.
- BB. Provide sleeves for all piping passing through concrete floor slabs and concrete, masonry, tile and gypsum wall construction.
- CC. Where sleeves are placed in exterior walls below grade the annular space between the pipe and the sleeves shall be sealed as detailed and made completely watertight. All pipes penetrating through floors (except slabs on grade) and fire walls (see Architectural Drawings for locations) shall be protected by fire proof sleeves as detailed on the drawings.
- DD. Provide escutcheon plates for exposed pipes passing through walls, floors, and ceilings. Plates shall be nickel-plated, split ring type. Where plates are provided for pipes passing through sleeves which extend above surface, provide deep recessed plates to conceal the pipe sleeves.

16.13 MEASUREMENTS

- EE. Before ordering any material or doing any work, verify all measurements at the project and be responsible for their correctness. No extra charges or compensation will be allowed on

account of any difference between actual dimensions and measurements indicated. Submit any differences found to the Architect for consideration before proceeding with the work.

17.14 NOISE REQUIREMENTS

- FF. All power driven equipment shall be quiet in operation and free from vibration. Connections to equipment shall be so designed and constructed that noise and vibration will not reach the conditioned area through piping or building construction.

18.15 EQUIPMENT BASES AND VIBRATION ISOLATION

- GG. Provide vibration isolation under all equipment such as pumps that have moving parts. Where suitable foundations are not detailed or specified, they shall be furnished in accordance with the manufacturer's recommendations.

19.16 ELECTRIC WIRING

- HH. All motor starters that are included as a part of the plumbing equipment shall be furnished under this division only when required by these specifications or the drawings. All other starters shall be furnished under Division 16, Electrical. Fractional HP motors shall have internal protection. Three-phase starters shall have three leg protection.
- II. Contractor shall verify voltage, phase, and all electrical load characteristics with the electrical contractor before ordering any equipment. The contractor shall include in his bid the cost of any additional items that will require electrical modifications to the specified equipment.
- JJ. All power wiring is included in Division 16, Electrical. Responsibility for proper connections and operation is included under this division.

20.17 INSTRUCTIONS

- KK. Instruct the Owner in the proper operation and maintenance of the equipment. At a time designated, provide an engineer or mechanic to go over the system and the maintenance manual with the Owner's representative to thoroughly familiarize himself with the operation and maintenance of the system.

END OF SECTION

SECTION 15610

SUMMARY OF WORK FOR PLUMBING

PART 1 GENERAL

2.1 DESCRIPTION

- A. Provide all labor, materials, equipment, and services necessary to furnish and install complete plumbing and piping systems as indicated or specified. Install and deliver all systems complete, in perfect working order, and in full accordance with the intent and meaning of the drawings and specifications. The work, in general, consists of, but is not necessarily limited to, the following:
1. Complete sanitary plumbing systems for the building with connections from the plumbing fixtures and equipment to the existing sewer main.
 2. A complete domestic water system including connection to city water main, new water meter, and connections to all plumbing fixtures and equipment.
 3. Rough-in and final connections of waste and water to special equipment specified under other sections of these specifications or supplied by Owner.
 4. Insulation including cold, tempered, domestic hot water roof drain, and over flow drain piping as specified.
 5. Fuel gas system, including meter, service line, and valved connections to all equipment using same.
 6. Plumbing specialties, including clean-outs, drains, fixture supports, interceptors, etc.
 7. Plumbing equipment as specified and scheduled.
 8. Plumbing fixtures as specified.
 9. Adequate supervision of erection, balancing, adjustments and instructions for proper operation and maintenance.
 10. Payment for all plumbing permits and inspection fees.
 11. Sterilization of potable water system.

3.2 RELATED WORK SPECIFIED ELSEWHERE

- B. The following work is included under other sections of these specifications.
- C. Air Conditioning: Division 15, Sections 15000 through 15599.
- D. Electrical, including power wiring and disconnect switches except as specifically required to be furnished herein: Division 16.
- E. Concrete: Division 3.
- F. Finish Painting: Division 9.

4.3 APPROVED MANUFACTURERS

- G. Specification herein by brand name is intended to establish a standard of quality. Further, this equipment has been checked as to size and weight requirements and space allocation has been made accordingly.
- H. Submittal of equipment by other acceptable manufacturers must be complete in every detail, including space requirements, weight, complete performance data, and supplemental data requested by the Architect. Contractor shall be responsible for assurance that the equipment meets all the requirements detailed in this and other sections, and indicated on the drawings.
- I. Each section includes a list of manufacturers whose equipment is acceptable as to manufacture, subject to conformance with all drawings, specifications and addenda items. Careful checking must be made to verify that the equipment will meet all capacities, requirements, space allocations and that the weights are not excessive.

PART 5 PRODUCTS

6.4 SUBMITTALS

- J. See General Conditions for shop drawing procedure.
- K. Submittals required under Section, Summary of Work for Plumbing, shall include, but not be limited to, the following:
 - 12. Plumbing equipment and specialties.
 - 13. Plumbing fixtures, cuts, trim, and fittings, roughing in dimensions and special supports.
 - 14. Pipe, fittings, valves and specialties.
 - 15. Insulation materials and finishes.
 - 16. Tanks and accessories.
 - 17. Foundation supports, hangers, and inserts.
 - 18. Miscellaneous other items required by the drawings and specifications and as directed for a complete plumbing system.
- L. Submit shall be in a pdf format with a complete list of all major items of plumbing equipment and materials as indicated above within thirty (30) days after award of contract. Submit all items bound together at one time in a neat and orderly manner. Partial lists will not be acceptable and will be returned unchecked.
- M. It shall also be understood that equipment and/or materials not submitted within thirty (30) days after the award of contract will in fact be furnished and installed as specified in the contract documents.
- N. Submittals shall include the manufacturer's specifications, physical dimensions, and ratings of all equipment. Furnish performance curves for all pumps. Where submittal sheet describes items in addition to that item being submitted, the submitted item shall be clearly marked on the sheet and superfluous information shall be crossed out.
- O. Equipment submittals shall be complete including space requirements, weight, electrical and mechanical requirements, performance data, and supplemental information requested by the Engineer.

7.5 CONNECTIONS TO UTILITIES

- P. Prior to submitting of bid, verify all water and sewer connections with the local utility company serving this project including invert elevations, size, pressure, etc. Include in

bid price all costs for permits, bonds, tap fees, construction of manholes, water meter installations, etc.

8.6 WORKMANSHIP

- Q. Install all work pertaining to water and sewer systems as close as possible to layout shown on the drawings. Employ skilled mechanics to install all systems in a manner acceptable to the Architect.

END OF SECTION

SECTION 15621

SANITARY WASTE AND VENT SYSTEM

PART 1 GENERAL

2.1 DESCRIPTION

- A. Provide all labor, materials, equipment and services necessary to furnish and install a complete sanitary waste and vent system as indicated or specified.

3.2 GENERAL

- B. All waste and vent piping to be standard weight asphalt coated No-Hub cast iron pipe and fittings. At Contractor's option, schedule 40 galvanized steel pipe with malleable iron or cast iron fittings will be acceptable for all vents 2-1/2" or smaller. Connect No-Hub iron pipe and fittings together with stainless steel shield clamp assemblies. The contractor may at his option provide PVC, sewer pipe for the building sewer (sewer piping 5'-0" outside of building) as indicated on the drawings.

4.3 TESTING

- C. Building Drain: Fill system with water to highest point in system and test with a minimum of 10 ft. head of water held for four (4) hours with no apparent leaks. If leaks appear, repair system and perform test again until system is tight.
- D. Building Sewer: Fill system with water and let stand for one hour before making the test. The contractor shall furnish a metal standpipe, and a suitable meter or method of measuring the quantity of water used. The allowable water loss for the building sewer shall not exceed 0.5 gph per 100 ft. of pipe, per inch of diameter of pipe under a minimum test head of 6 ft. above the top of the pipe at the upper end.

PART 5 PRODUCTS

6.4 PIPING

- E. PVC pipe, conforming to ASTM D3033 or D3034 schedule 40 DWV.

7.5 FITTINGS

- F. PVC fittings conforming to ASTM D2665-85 schedule 40 DWV.

8.6 NO-HUB COUPLINGS

- G. (Double band stainless steel couplings with neoprene liner conforming to CISPI No. 301 specifications.) (Stainless steel coupling with neoprene liner equal to "Huskey" or "Tyler-Wide Body".)

PART 9 EXECUTION

10.7 WASTE AND VENT PIPING INSTALLATION

- H. Pitch waste and drain lines 4" and smaller at a uniform slope of 1/4" per foot minimum.
- I. Pitch waste and drain lines larger than 4" at a uniform slope of 1/8" per foot minimum, unless noted otherwise on the drawings. Where piping on the exterior of the building is required to be installed at a slope of less than 1/8" per ft. the slope shall be verified by the design engineer or a designated representative prior to backfilling the trench.

- J. Use reducing fitting or recessed reducers to make changes in pipe sizes on all waste and drain lines.
- K. Make all changes in directions by the appropriate use of 45 degree wyes, half wyes, long sweep 1/4 bends, 1/6, 1/8, or 1/16 bends, except that sanitary tees may be used in soil and waste lines where the change in direction of flow is from the horizontal to the vertical.
- L. Lay piping with bell ends pointing up grade and support firmly and uniformly. PVC piping shall be installed on a bed of sand, a minimum of 8" thick.
- M. Make up mechanical joints as recommended by the manufacturer. Use torque wrenches. Remake leaky caulked joints with all new material.
- N. Temporarily close ends to pipes with wood blocks at end of each working day.
- O. Install cleanouts on all waste stacks serving sinks, as indicated on the drawings and on waste lines at all change of directions, 100'-0" (max.) o.c. on straight runs and as required by local plumbing code. Cleanouts to be the same size as waste lines on which they are installed. Make all cleanouts accessible by either locating within 6" of ceiling access panel, extending to floor or grade, or locating in wall with removable plate. Where surfacing materials, such as resilient floor covering or ceramic tile is used, install the cleanout with top so that finished surface is smooth and flush. Where installed in waterproofed slabs, provide cleanouts with a non-puncturing flashing device and anchoring flange.

END OF SECTION

SECTION 15641

DOMESTIC WATER SYSTEM

PART 11111112

GENERAL

3.2 DESCRIPTION

- B. Provide all labor, materials, equipment and services necessary to furnish and install a domestic water system complete as indicated or specified. Install all piping above floor unless noted otherwise on the drawings. Use type "L" hard copper for all water lines above grade. Use type "K" hard drawn copper for all water lines indicated below grade but not below concrete floor slabs. Use wrought copper solder type fittings at all copper pipe connections. Use type "K" soft drawn copper (one piece with no joint below floor) for all water lines indicated below concrete floor slabs. Install copper or PVC pressure pipe for exterior yard mains, where indicated on the drawings. Wirsbro Aquapex may be used installed per manufactures recommendations.

4.33 DISINFECTION

- D. Disinfect the entire water distribution system thoroughly with a solution containing not less than 50 parts per million of available chlorine. For the chlorinating material, use sodium hypochlorite solution conforming to Federal Specification 0-8-441, Grade D, and introduce into the system in a manner approved by the Architect. Allow the disinfection solution to remain in the system for a period of 8 hours, during which time all valves and faucets shall be opened and closed several times. After disinfection, flush the solution from the system with clean water until the residual chlorine content is not greater than 0.2 parts per million, unless otherwise directed. Provide test report to architect after completion of disinfection.

5.45 TESTING

- F. Test domestic water system with a minimum of 125-psi hydrostatic pressure, hold for four (4) hours.

PART 657 PRODUCTS

7.6 PIPING

- H. Type "L" hard drawn copper, conforming to ASTM B-88.
- I. Type "K" hard drawn copper, conforming to ASTM B-88.
- J. Type "K" soft drawn copper, conforming to ASTM B-88.
- K. Wirsbro Aquapex conforming to ASTM F876
- L. Color identify all copper piping with size of pipe, manufacturer's trademark, and conform to the following schedule:
 - Type "K"--Green
 - Type "L"--Blue

8.713 FITTINGS

- N. Provide wrought copper type fittings conforming to ANSI B16.22 for all connections to copper piping.

- O. Polyvinyl Chloride fittings shall be schedule 40-socket type conforming to ASTM D2466 with ASTM D2855 solvent weld joints with ASTM D2564 solvent cement.
- P. The contractor may at his option, provide mechanically formed tee connections known as T-Drill. The branch shall be notched to conform with the inner curve of the run tube and dimpled to insure that the penetration of the branch tube into the collar is of sufficient depth for brazing and that the branch tube does not obstruct the flow in the main line tube.
- Q. All joints shall be brazed as recommended by the Copper Development Association Copper Tube Handbook using BCuP series filler metal. Note: Soft soldered joints shall not be permitted.
- R. Where the contractor elects to use the T-Drill method, he shall not drill into piping 1" or smaller and in all cases the branch line shall be at least one pipe size smaller.

9.819 SOLDER

- T. Lines 1/2" thru 2": Use 95/5 solder with suitable flux.
- U. Lines 2-1/2" and larger: Use Aircosil 45, or other silver brazing alloy of equivalent melting point and physical properties. Use Aircosil flux, or equal suitable to brazing alloy.

PART 10 922 EXECUTION

11.10 INSTALLATION

- W. Extend water piping to all fixtures, outlets and equipment. Provide shut-off valves or fixture stops, as required for proper service.
- X. Pitch water piping to drain and install all necessary drain valves.
- Y. Provide capped or plugged valved outlets where indicated for future equipment connections.
- Z. Bury all copper underground water piping a minimum of 24 inches below finish grade or natural frost line.
- AA. Provide dielectric unions at connections of dissimilar metals.
- BB. Install all pipe in accordance with manufacturer's recommendations. Provide concrete thrust blocks at all change of directions, end of lines, tees, etc.
- CC. Install copper lines below concrete floors so that no joints occur below floor and wrap with 20 mils of polyethylene tape with a minimum of 50% overlap.
- DD. Hold lines which are specified to be insulated a sufficient distance from other work to permit installation of insulation.
- EE. PVC piping installed below concrete slabs or blacktop driveways or parking areas shall be sleeved within a material the same as the piping. Field verify the exact size and location.

END OF SECTION

SECTION 15661

FUEL GAS SYSTEM

PART 1 GENERAL

1.1 DESCRIPTION

- A. This section describes the labor, materials and installation requirements necessary to install fuel gas system.

1.2 GENERAL

- A. Use black steel pipe with malleable iron screwed fitting for all gas line piping 1-1/2 inches and smaller. Gas lines 2 inches and larger and all buried piping use welded fittings. Use flanges on piping 2 inches and larger and unions on piping 1-1/2 inches and smaller. Piping installed below grade may be polyethylene pipe.

1.3 TESTING

- A. Test fuel gas system with 60-psi air pressure and hold for four (4) hours.

PART 2 PRODUCTS

2.1 PIPE

- A. Above grade black steel pipe: Schedule 40 black steel conforming to ASTM A-53, grade A or B, seamless or welded pipe.
- B. Below grade polyethylene pipe: JM Eagle PE medium density polyethylene yellow, natural gas pipe and tubing stamped with ASTM D2513.

2.2 FITTINGS

- A. Malleable Iron: Heavy black malleable iron conforming to ANSI B16.3, 150 psi SWP.
- B. Welding Fittings: Black steel seamless full pattern welding fittings conforming to ANSI B16.9 and ANSI B16.25, 150-psi SWP.
- C. Fusion Fittings: Polyethylene manufactured in accordance with ASTM D2513. Socket fusion fittings conform to ASTM D2683 and Butt fusion fittings conform to ASTM D3261.

2.3 UNIONS

- A. Black malleable iron, screwed connections, ground iron to bronze seat, conforming to ASTM A.47, 250 psi SWP.

2.4 FLANGES

- A. Black forged steel with weld neck flanges conforming to ANSI B16.5, 150 psi SWP.

2.5 VALVES

- A. Main service valves: 1-1/2" and smaller, Rockwell-Nordstrom No. 142 lubricated plug valve with No. 555 lubricant for natural gas service. 2" and larger, Rockwell- Nordstrom No. 143 lubricated plug valve with No. 555 lubricated for natural gas service.

- B. Appliance and Room Zone Service Valves: 1-1/4" and smaller, shall be Milwaukee A.G.A. approved "Butterball" valve.

2.6 GAS SERVICE PRESSURE REGULATORS

- A. Fisher series S100 or S200 diaphragm actuated pressure regulator suitable for natural gas service. Orifice to be sized to regulate cubic feet per hour at inlet and outlet pressures as scheduled on the drawings.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install all piping in the building above floor or in accessible trenches where indicated on the drawings. Install no gas piping in or under concrete floors or in masonry walls. Where gas lines are indicated to be sleeved below walks and rise on inside of building, install in accordance with standard city gas sleeve details.
- B. All welding and/or fusion bonding shall be performed using established welding procedures by welders who have been certified for the welding procedure to be used in accordance with Title 49 - Transportation, Code of Federal Regulations, Parts 190, 191 and 192, and API 1104.
- C. Supervise the proper installation of gas meter and pressure regulator by contractor.
- D. Extend gas lines from meter only and/or pressure regulators to all equipment and connections requiring gas.
- E. Provide gas pipe with suitable dirt legs (minimum 6") at equipment connections.
- F. Provide capped gas at all equipment connections.
- G. Provide galvanized steel pipe or wrap in accordance with underground piping for all pipe exposed to weather.
- H. Coordinate piping with mechanical ductwork.
- I. Do not install gas piping in mechanical air ducts.
- J. Underground gas piping (whether metallic or plastic) shall be placed in trenching which is not less than 24" (plus the outside diameter of the pipe to be installed) below finished grade, and shall have both a minimum bed of 6" and a protective cover of 6", using sand or material of equivalent grit size for this purpose. An additional fill of sand or clean soil shall be provided to assure a minimum total cover of 18". "Sand" shall be defined as material which will pass a No. 4 sieve (approximately 3/16") and which will assure a natural compaction equivalent to sand. Cover less than 18" may be approved when a concrete cap extending a minimum of 6" on both sides of the pipe and having a minimum thickness of 3" is placed directly over and a minimum of 6" above the gas piping being protected.
- K. Where polyethylene pipe is installed below grade the contractor shall furnish and install anodeless risers.

3.2 CORROSION PROTECTION FOR UNDERGROUND GAS PIPING

- A. General: Ferrous gas piping installed underground shall be protected from corrosion by approved machine-applied coatings and by cathodic protection. Piping shall have at least 24 inches of earth cover or other equivalent mechanical protection.

- B. Coated Pipe: Coated pipe listed by a listing agency is deemed approved. The coated pipe shall be labeled. Field wrapping is restricted to fittings and pipe ends stripped for threading or welding. Galvanizing shall not be deemed adequate protection for piping below ground in lieu of machine applied coatings.
 - C. Wrap all gas piping installed below grade or exposed to weather in accordance with Manville Specification 220.
 - D. Pipe Preparation: Remove oil, grease, rust, scale, moisture or other foreign materials by wire brushing or, if necessary, by sandblasting. Remove all metal burrs; weld slag, or sharp points. Do not use oil base solvents for cleaning.
 - E. Materials: Manville Trantex E-12 (12 mil thickness) polyethylene black tape with width as per manufacturer's recommendations.
 - F. Overlap: Half width of tape used.
 - G. Application of Coating: Machine apply tape to pipe by spirally wrapping. The equipment may either be stationary or portable over-the-ditch tape wrapping machines.
 - H. Field Joints, Tees and Fittings: Hand wrap over clean surface with tape 3/4" wide for pipe up to 1" and 2" wide for pipe 1-1/2" and larger, extending from two to six inches over existing line coating depending on the pipe diameter. Use same cleaning procedure as specified for pipe preparation. Minimum overlap of half width of tape used.
- 1. Priming: Use Manville Trantex No. 22 adhesive primer to obtain a maximum bond of coating to pipe.

3.3 CATHODIC PROTECTION

- B. The contractor shall include in his contract the services of a company that specializes in designing and installing cathodic protection. The company shall have an engineer registered in the State of Arizona that shall design the cathodic protection system. Upon completion of the design the contractor shall submit the design for review and after the system is installed the cathodic protection design engineer shall certify the acceptability of the installation to the Building Official. The installation shall conform with Parts 191 and 192 of Code of Federal Regulations Title 49.

END OF SECTION

SECTION 15710

SPECIALTIES

PART 1 GENERAL

2.1 DESCRIPTION

- A. Provide all labor, materials, equipment, and services necessary to furnish and install miscellaneous materials and equipment for the plumbing systems as indicated or specified.

3.2 APPROVED MANUFACTURERS

- B. The following manufacturers are approved for use subject to the detailed requirements of the drawings and these specifications.
 - 1. Floor Drains, Sinks, and Cleanouts: J. R. Smith, Zurn, Josam, Wade.
 - 2. Fixture Supports: Zurn, J. R. Smith, Wade, Josam.
 - 3. Hose Bibbs: Acorn, J. R. Smith, Woodford.
 - 4. Wall Hydrants, Ground Hydrants: Wade, J. R. Smith, Zurn, Josam, Woodford.
 - 5. Shock Absorbers: Zurn, Wade, Josam, J. R. Smith.
 - 6. Gate, Globe, Valves: Milwaukee, Stockham, Hammond.
 - 7. Ball Valves: Apollo, Watts, Hammond.
 - 8. Pipe Hangers: Grinnell, B-Line, Fee & Mason, Elcen, Superior, Michigan.
 - 9. Access Panels: Wade, J. R. Smith, Zurn, Josam.
 - 10. Backflow Preventors: Zurn Wilkens Series, Watts
 - 11. Water Tempering Valves: Powers, Symmons, Leonard.

PART 4 PRODUCTS

5.3 CLEANOUTS

- C. Interior Concrete and Tile Floors: Wade W-7000, J. R. Smith #4020, Zurn #1400, Josam #56010 with scoriated nickel bronze top.
- D. Interior Finished Walls: Wade W-8460-R, J. R. Smith 4532, Zurn Z-1445-1, Josam 58790-15.
- E. Exposed Vertical Cleanouts: Wade W-8560-D, J. R. Smith 4510, Zurn Z-1445, Josam 58510.
- F. Outside Yard Cleanouts: Wade W-8300-MF, J. R. Smith 4253, Zurn Z-1460-15, Josam 58680 with 18" x 18" x 6" deep poured concrete pad at grade.
- G. Terrazzo Floors: Wade-7000-US, J. R. Smith 4183, Zurn Z-1425-5, Josam 56020-12 with nickel bronze top.

Note: Provide all cleanouts with heavy threaded bronze plugs.

6.4 DRAINS

- H. General: Provide cast iron body drains with lacquer finish and inside caulk outlet. Where installed in surfaces having waterproofing membrane, provide drains with non-puncturing flashing clamp device and anchoring flange. See plans for type of grate to be furnished on floor sinks.
- I. Floor Drains:
 - 12. Equipment Rooms and Unfinished Areas: Wade W-1310-TD, J. R. Smith 2220, Zurn Z-551, Josam 32120 with nickel bronze strainer and shallow type bucket strainer.
 - 13. Toilet Rooms and Finished Areas: Wade 1100-G, J. R. Smith 2010-B, Zurn Z-415, Josam 30000-S with 6" x 6" square nickel bronze strainer. (Note: This contractor shall coordinate final strainer selection with architect/owner prior to submittal and coordinate installation with finish floor material.)
- J. Floor Sinks: Wade W-2530, J. R. Smith 3151, Zurn ZN-1801, Josam 49050, 12" x 12" x 8" cast iron floor sink with A.R.E. interior flat bottom strainer, aluminum sediment bucket and nickel bronze grate.
- K. Shower Drains:
 - 14. Single Shower Drain: Wade W-1100-STD, J. R. Smith 2010-A, Zurn Z-415, Josam 30000-A, with 6" round nickel bronze strainer.

7.5 FIXTURE SUPPORTS

- L. General: Provide 1/4" bolts or screws of sufficient length to securely fasten the fixture to the backing wall or closet ring.
- M. Masonry or concrete construction: Fixtures supported from masonry or concrete walls shall have their hangers secured with 5/16" bolts in tamp-in type anchors. Wood plugs are not approved.
- N. Studs: Fixtures set against stud walls shall have their hangers secured to a metal backing plate. Install 1/4" thick and 4" wide steel metal backing plates at the time the rough piping is installed. Attach plate to a stud at each end of the plate and to each stud, which it passes. Attach plate by bolting not less than 2-1/2" U-bolts per stud with bolts through the plate and around the flange of the stud.
- O. Wall hung fixtures: Where indicated, provide Wade supports of appropriate pattern.

8.6 HOSE BIBBS

- P. At building: Woodford #24P-3/4, 3/4" lockshield wall faucet with integral flange, lockshield, loosekey, vacuum breaker, and 3/4" hose end. Exterior units shall have rough brass body. Interior units shall have polished chrome-plated body.
- Q. In planters: Acorn No. 8126, 3/4" rough brass, bent nose standpipe faucet with lockshield, loose key, vacuum breaker, and 3/4" hose end.
- R. Recessed Wall Hydrants:
 - 15. Wall Hydrant: Woodford B74, Wade W-8635-89, J. R. Smith 5709, Zurn Z-1330, Josam 71020 3/4" anti-siphon wall hydrant with nickel brass box, integral backflow preventer, and key lock.
 - 16. Non-Freeze Wall Hydrant: Woodford B65, Wade W-8625, J. R. Smith 5509, Zurn Z-1300, Josam 71000, 3/4" anti-siphon, non-freeze wall hydrant with nickel brass box, integral backflow preventer, and key lock.

9.7 SHOCK ABSORBERS

- S. Wade W-5, W-10, W-20, W-50, W-75 or W-100, J. R. Smith 5005, 5010, 5020, 5030, 5040, 5050 or 5060, Zurn Z-1700 series, #100 through #600, Josam 1485-1 through 1485-6, shocktrol size as scheduled on the drawings. Provide access panels as required for removal.

10.8 TRAP PRIMER

- T. Wade 2400, J. R. Smith 2699, Zurn Z-1022, Josam 88250, 1/2" automatic trap primer with solder unions. Provide access panels with locking covers as required for removal. Furnish and install trap primers on all toilet area floor drains and as required by local plumbing code, install automatic trap primers on cold water supply at nearest fixture and run drain to trap seal being protected. See the drawings for location and manufacturer of trap primers that cannot be installed as indicated above

11.9 VALVES

- U. Gate Valves: Hammond IB648, 150# solder joint for all lines up to 2" in diameter. Hammond IB629, bronze trimmed, 150# W.P. screwed joint for all valves 2" thru 3". Hammond IR1138, 125# iron body bronze trim, flanged ends for all valves 4" and larger.
- V. Check Valves: Hammond IB912, #150 solder joint for all valves up to 2" in diameter. Hammond IB904, screwed joint for all valves larger than 2" in diameter.
- W. Globe Valves: Hammond IB423, 150# solder joint for all valves up to 2" in diameter. Hammond IB413T, 150# all bronze screwed joint for all valves larger than 2" in diameter.
- X. Ball Valves: Hammond 8614, three piece, full port, bronze trim, solder joint for all valves up to 2-1/2" in diameter. Nibco #F-510 series, carbon steel body with 316 stainless steel trim, and flanged joints for all valves 3" and larger.
- Y. Strainer: "Y" Type, 125-PSI SWP, gray cast iron, bronze monel or stainless steel perforations as recommended by manufacturer for size and service intended. Provide three-piece, full flow ball valve the same size as the unreduced plug connection (blow off connection) on all "Y" strainers. On plug connections 1-1/4" and larger the valve shall be piped directly to the nearest floor sink. Provide one-piece, full flow ball valve the same size as the unreduced plug connection (blow off connection) on all "Y" strainers where the unreduced plug connection is 1" or smaller. Plug connection 1" and smaller shall be provided with a hose end.
- Z. Flexible piping connectors shall be (stainless steel braided bronze connection with copper tube ends) (stainless steel braid and carbon steel fittings, flanged for 3" and larger, threaded male nipples for 2-1/2" and smaller). Install in accordance with the manufacturers recommendations.

12.10 Thermometers: 4" round mercury filled dial type thermometers, 1% $\pm$ accuracy, industrial universal joint, concealed capillary. Sealed well to be 1/2" pipe diameter in length. Temperature 30 degrees to 240 degrees.

13.11 Pressure Gauges: 4" round, cast case, 1/2% accuracy. Provide gauge range with operating point in the middle half of scale and compound range for gauges subject to subatmospheric pressures.

AA. Pressure Gauge Cocks: Crane, Whitey, Trefice, 2000# needle valve

PART 14 EXECUTION

15.12 FLASHING

- BB. Supply flashings for all vent pipes through roof to be installed with roofing. Flash vents with 4-pound sheet lead. Extend flashing into roofing at least 10 inches from vent, and turn flashing over and down into vent opening.

16.13SLEEVES

- CC. Unless otherwise detailed or specified, construct 24 gauge galvanized steel sleeves around pipes passing through masonry and concrete walls, concrete slabs, stems, etc.

17.14ESCUTCHEON PLATES

- DD. Install cast brass split ring with set screw at all locations where pipes pass through walls, floors, and/or ceilings. Provide polished chrome plated escutcheons in finished rooms; all others, polished brass.

18.15PIPE HANGER AND SUPPORTS

- EE. General: Adequately support piping against sagging, pocketing, swaying, and displacement. Properly space and apply hangers to achieve the result, and not farther apart than the following:

17. Cast Iron Pipe:

5 foot on center and all branches in excess of 30" long. Pipe exceeding 5 ft. in length may be supported at not more than 10 ft. intervals. Provide supports within 18" of the joints on both sides.

18. Steel Pipe:

3/4" and smaller	8 foot on center
1-1/4 thru 2"	10 foot on center
2-1/2 thru 4"	12 foot on center

19. Copper Tubing:

3/4" and smaller	6 foot on center
1" and 1-1/4"	8 foot on center
1-1/2" and 2"	10 foot on center
2-1/2" thru 4"	12 foot on center

20. Plastic Piping:

3/4" and smaller	3 foot on center
1" and 1-1/4"	4 foot on center
1-1/2" and 2"	5 foot on center
2-1/2" thru 4"	6 foot on center

- FF. Trapeze Hangers: Use approved channel, supported from structure with full threaded rod. Space hangers for smallest pipe in the group from the schedule above. Secure piping to the channel. Where piping is insulated, provide pipe clamp around outside of insulation. Do not damage insulation.

- GG. Pipe Supported From Wall: Use hanger supported from F & M Fig. 151 wall bracket.

- HH. Piping Vertical: Secure with F & M Fig. 238 riser clamp. For steel pipe use F & M 378 or 368 for copper tube risers.

- II. Single Pipe Hanger: Use F & M Fig. 239 for steel or cast iron pipe and Fig. 364 copper clad clevis hanger for copper pipe with washers and double nuts on the rod. Support from structure with full threaded rod.

- JJ. Install "Stoneman" trisolators to isolate all uninsulated copper piping, or provide copper coated hangers.

KK. Size all hangers on insulated lines to fit around outside diameter of insulation specified with allowance for F & M Fig. 81 galvanized sheet metal shield.

LL. Support 1/2" thru 12" piping with all-thread rod per the schedule below:

Pipe Size	Minimum Rod Size
1/2" thru 2"	3/8"
2-1/2" thru 6"	1/2"
8" thru 12"	5/8"

19.16 ACCESS PANELS

MM. Unless otherwise specified under the architectural section of the specifications, the contractor shall furnish and install the following access panels.

NN. Wall type access panels shall be equal to J.R. Smith #4762, stainless steel construction with key lock.

END OF SECTION

SECTION 15720

EQUIPMENT

PART 1 GENERAL

2.1 DESCRIPTION

- A. Provide all labor, materials, equipment, and services necessary to furnish and install complete plumbing equipment as indicated or specified.

3.2 APPROVED MANUFACTURERS

- B. The following manufacturers are approved for use subject to the detailed requirements of the drawings and these specifications.
 - 1. Water Heaters: A. O. Smith, Ruud, Rheem, PVI.
Instantaneous Water Heater: Rinnai or Bosch
 - 2. Filters: Zeks, Pall, Wilkerson, Norgren.
 - 3. Circulating Pumps: Grundfos Commercial Series, Taco, Bell & Gossett, PACO.

PART 4 PRODUCTS

5.3 DOMESTIC WATER HEATERS

- C. Provide A.G.A. and/or UL approved and labeled water heaters, controls, and 100% safety pilots on all gas fired equipment where required by authorities having jurisdiction. (All gas fired pressure vessels shall be ASME labeled.) All electrical equipment and controls shall be UL listed. Heater shall be fully warranted for a minimum of (three) (five) (ten) full years after final acceptance of the building.
- D. Electric: Automatic electric operated storage type of the size, capacity, and make as scheduled on the drawings. Heater shall be UL labeled. (The tank shall be ASME labeled.) Coordinate voltage and phase with electrical drawings before ordering. Furnish heaters with the following accessories:
 - 4. Factory equipped with an ASME combination 210°F temperature and 125 psi pressure relief valve. Run full size drain to atmosphere or as indicated on the Drawings.
 - 5. Immersion thermostat.
 - 6. High limit control.
 - 7. Magnesium anode.
 - 8. (20 W/sq. in.) (40 W/sq. in.) Incoloy elements.
 - 9. Solid-state proportional sequencer (72 caw and up).
- E. Gas: Automatic (natural) (propane) gas fired storage type water heater of the size, capacity, and make as scheduled on the drawings. Furnish heaters with the following accessories:
 - 10. Factory equipped with an ASME combination 210°F temperature and 125 psi pressure relief valve rated in excess of heater Btu input. Run full size drain to atmosphere.

11. Automatic thermostat actuated controls with 100% shut off.
12. Dual high-limit controls.
13. Tank drain.
14. Hanhole cleanout.
15. Heater shall be factory insulated and sheet metal jacketed.

END OF SECTION

SECTION 15730

FIXTURES

PART 11111112

GENERAL

3.2 DESCRIPTION

- B. Provide all labor, materials, equipment, and services necessary to furnish and install all plumbing fixtures as indicated or specified.

4.33 APPROVED MANUFACTURERS

- D. The following manufacturers are approved for use subject to the detailed requirements of the drawings and these specifications.

2.Fixtures: Toto, American Standard, Kohler, Crane.

3.Mop Basins: Wolverine, Fiat

4.Electric Water Cooler: Elkay, Halsey-Taylor.

5.Plumbing Supply Fittings: Royal, Standard, Crane, Kohler, Eljer.

6.Plumbing Supply Fittings: Chicago, T & S Brass, Sloan

7.Plumbing Supply Stops: Eastman, Standard, Crane, Kohler, Eljer, Brasscraft.

8.P-Traps and Continuous Waste Assemblies: Standard, Crane, Kohler, Eljer, Frost, Dearborn, McGuire.

9. Stainless Steel Sinks: Elkay, Just.

10.Flush Valves: Sloan, Delany.

11.Closet Seats: Sperzel, Church, Olsonite, Beneke, Bemis.

12.Tempering Valves: Wolverine, Powers, Symmons, Leonard.

13.Shower Control Valves: Wolverine, Powers, Symmons, Leonard.

5.4514 RELATED WORK SPECIFIED ELSEWHERE

- F. Caulking around plumbing fixtures, Section "Caulking and Sealants."

6.57 COMMON REQUIREMENTS

- H. Use polished chrome plated, adjustable brass P-traps and waste arms with wall escutcheons at all exposed locations. Use polished chrome plated faucets with removable trim, brass body and brass handles. Fixtures and supply fitting shall be as specified. Provide diaphragm type polished chrome plated flush valves with integral vacuum breakers and screwdriver stops. Provide fixture stops and valves ahead of all equipment or fixtures. After fixtures are set in place and secured, caulk all around between fixtures and wall/floor with either "Dow Corning No. 780" or "G.E. Construction Sealant" white silicone caulking compound.

- I. Maximum flow rates of water usage for plumbing fixtures shall be as follows:

15. Water Closets - 1.6 gallons per flush.

16.	Urinals	-	1.0 gallons per flush.
17.	Kitchen Sink	-	3.0 gallons per minute.
18.	Lavatory	-	0.5 gallons per minute.
19.	Shower	-	3.0 gallons per minute.

J.20 The plumbing contractor shall be responsible for installing "handicapped" water closet(s) in such a manner that the "flush control handle" is located to the wide side of the water closet(s).

END OF SECTION

SECTION 15790

INSULATION

PART 11111112

GENERAL

3.2 DESCRIPTION

- B. Provide all labor, materials, equipment, and services necessary to furnish and install all pipe insulation complete as indicated or specified. All insulation shall be furnished and installed by a licensed, approved Insulation Contractor.

4.33 APPROVED MANUFACTURERS

- D. The following manufacturers are approved for use subject to the detailed requirements of the drawings and these specifications.
 - 2. Premold: Certain Teed, Owens-Corning, Manville.
 - 3. Protective Jacket: Childers, Manville, Glasco.
 - 4. Cellular Plastic: Armstrong, Owens-Corning, Certain Teed.
 - 5. Hard Sections (only): CRB "Poly-Pipe", B-Line, Pipe Shield.

PART 5456 PRODUCTS

6.5 PIPE INSULATION

- F. General: Insulate all service hot water supply and return, tempered water supply and return, (cold water), (roof drain and overflow drain piping).
- G. Materials: One or two-piece fiberglass, minimum 3.5 PCF or heavy density, maximum K = 0.25 at 75 degree F. ASJ jacket with lap sealed with adhesive and stapled with outward cinch staples. Molded plastic (Zeston) fitting covers with fiberglass insulation on concealed piping. Eight-ounce canvas jacket, lapped and sealed with fire retardant mastic, insulation cement, flush with pipe covering on exposed piping.
- H. Thickness:
 - 7. Mains and horizontal branches minimum 1".
 - 8. Drops in walls and partitions minimum 1/2".
- I.9 Application:
 - 10. Fiberglass: Coat underside of longitudinal laps and 4" wide transverse stripping tape with vapor barrier adhesive and staple through adhesive 3" o.c. Coat staples with adhesive. Cover exposed piping, piping in equipment rooms, and piping accessible by permanently installed stairs or ladders with 8-ounce canvas set in place with staples and adhesive. Concealed fittings, valves, etc., shall be covered with Zeston or equal fitting covers with all seams sealed with adhesive--NO staples. All Zeston fitting covers shall be packed full of fiberglass insulation, maximum K = 0.33. Cover exposed fittings, valves, etc., with insulation and 1/4" hard finish plastic cement, 8-ounce canvas, and lagging adhesive. Provide hard sections of insulation (calcium silicate) at all hangers, minimum 6" long.
 - 11. Insulate piping installed below slab and/or grade with cellular plastic with a K = .

27 at 75 degrees F and water vapor transmission rate of 0.1 perm/inch or less ASTM C177 and C355.

12. Install insulation by slitting tubular sections and applying over piping or sliding the tubing, unslit, over the end of the piping. Fabricate miter cut covers for fittings from insulation in conformance with manufacturer's recommendations. Furnish with four coats, 1/16" thick, weatherproof mastic reinforced with glass mesh. Install insulation and finish per manufacturer's recommendations.
- J.13 Hangers and Supports: 180 degree, 20-gauge galvanized steel shield banded in place with two 1/4" bands, 4" long for 1-1/2" pipe, 6" long for 2" and over. Install 180 degree hard sections (calcium silicate) same length as shield at each hanger.
- K. Exposed to Weather:
 14. Scope: Cover all piping and fittings exposed to weather with aluminum jacket, sealed weathertight.
 15. Material: Corrugated or smooth 0.017" aluminum with polykraft moisture barrier factory attached snap seal longitudinal seams.
 16. Fitting & Valve Covers: All aluminum minimum 0.016" thick, pre-molded or miter cut.
 17. Bands: Minimum 0.016" thick, 2" wide, snap-straps, max. 24" o.c. or 0.010" thick, 1" wide, 12" o.c.

7.61218 STORAGE TANK INSULATION

- M. Insulate storage tank for domestic hot water system with 2" thick rigid fiberglass blocks installed in strict accordance with manufacturer's recommendations. Securely wire insulation in place with wire mesh and cover with a 1/2" thick finish coat of asbestos cement with 8 oz. canvas jacket finished with two coats of "Sealfas" 30-36. Bevel insulation around manholes to permit removal without damage to the insulation.
- N. Insulate storage tank for domestic hot water system with 2" thick rigid fiberglass pipe and tank insulation with factory installed ASJ finish.
- O. All insulation joints shall be firmly butted. Insulation may be secured with adhesive, mechanical fasteners, or banded. Locate fasteners no more than 12" on center and a maximum of 3" from each edge. Vapor retarders shall overlap a minimum of 2" at all seams and be sealed with appropriate pressure sensitive tape or mastic. Finish with 8 oz. canvas jacket and two coats of Foster 30-36.

END OF SECTION

SECTION 23 83 13

GUTTER AND DOWNSPOUT DE-ICING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Electric heating cable for deicing of gutters and downspouts.

1.02 SYSTEM DESCRIPTION

- A. Design Requirements: Furnish and install a complete UL Listed, CSA Certified, and FM Approved system of specified heating cable, components, and controls listed specifically for keeping roof drains, gutters and downspouts from being clogged by ice and snow.
- B. Performance Requirements:
 - 1. Power Output: For sufficient power for roof and gutter de-icing and energy conservation, the self-regulating heating cable shall have a nominal power output of 12 watts per foot in snow and ice and 5 watts per foot in air, per IEEE 515.1-1995, Section 4.2.6. Products that do not meet this requirement are not acceptable.
 - 2. Mechanical Toughness: To provide superior abrasion resistance and mechanical impact resistance, the heating-cable outer jacket shall be an abrasion-resistant fluoropolymer. The cable shall have a minimum impact resistance of 10 ft-lb at 0 deg. C installation temperature per IEEE 515-1997, and a crush resistance of 2000 lb per UL1588-1993.
 - 3. UV Stability: Cable and components shall be qualified for prolonged exposure to the sun per IEEE 515.1-1995, Section 4.3.2, and UL1588-1993. Cable outer jacket shall be fluoropolymer for UV protection.
 - 4. Submersion in Water: The cable and components shall be qualified to withstand continuous submersion in water for 2000 hours per IEEE 515.1-1995, Section 4.3.1.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's specifications, design data and installation instructions.
- B. Shop Drawings: Submit drawings showing layout, dimensions and construction details.
- C. Certificates: Submit manufacturer certification that products furnished meet specification requirements.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Installer shall have completed projects of similar size, and/or has been trained or certified by the manufacturer for installation of system.
 - 2. Installation of electrical rough-in and electrical connection of deicing system shall be by a licensed electrician in accordance with IEC and UL.
- B. Regulatory Requirements:
 - 1. All heating cable components shall be UL Listed, CSA Certified, or FM Approved for use as part of the system to provide roof and gutter de-icing.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in manufacturer's original unopened packaging with labels intact. Protect finished surfaces with removable wrapping or coating which will not bond when exposed to sunlight.
- B. Storage: Adequately protect against damage while stored at the site.
- C. Handling: Comply with manufacturer's instructions.

1.06 WARRANTY

- A. Furnish manufacturer's standard covering defects in material and workmanship for the following:
 - 1. 10 year warranty on deicing cable.
 - 2. 2 year warranty on controller.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of the following manufacturers, except as otherwise approved by the Architect, subject to compliance with specifications requirements:
 - 1. Raychem Corporation.

2.02 MATERIALS

- A. Heating Cable: IceStop, GM-2XT cable as manufactured by Raychem Corporation.
 - 1. Self-regulating heating cable shall consist of two (2) 16 AWG nickel-coated bus wires embedded in a self-regulating polymer core that varies its power outlet to respond to temperature along its length, allowing the cable to be crossed over itself without overheating, to be used with wood, plastic, and asphalt building materials and to be cut-to-length in the field.
 - 2. The heating cable shall operate on 208 volts.
- B. Attachment Accessories: Provide manufacturer's standard attachment clips and downspout hangers as required for a complete installation.
- C. Automatic Snow Controller:
 - 1. System shall be controlled by snow and ice melting sensors to reliably detect moisture and temperature for surface snow melting and roof and gutter de-icing. The sensors shall be the CIT-1 Aerial Snow Sensor(s) and GIT-1 Gutter Sensor(s).
 - 2. Automatic snow controller(s) shall be the APS-4C snow melting and gutter de-icing controller with integral 30mA ground fault protection as required by National Electric Code, Article 426. Controller shall include adjustable hold on timer to insure operation after snowfall has stopped.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

- A. Heating cable shall be laid in gutters; shall be suspended in downspouts either as a loop or a single length and held in place by a downspout hanger; and shall be attached to the roof using the appropriate roof clip.
- B. Heating cable shall be protected from damage and installed according to manufacturer's instructions.

3.03 FIELD QUALITY CONTROL

- A. Tests: Per manufacturer's installation manual, the dielectric jacket's insulation resistance shall be tested with a 2500 Vdc megohmmeter, and cable continuity shall be tested. Insulation resistance from the conductors to the shield shall be greater than 1000 megohms.

3.04 CLEANING

- A. During the course of the Work and on completion of the Work, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 16050

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

2.1 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. Drawings and Data:
 - 1. Electrical drawings are generally diagrammatic and location of outlets and equipment is approximate; exact routing of raceways, locations of outlets and equipment shall be governed by structural conditions and obstructions. This is not to be construed to permit system redesign. All outlets and equipment shall be interconnected as the Contract Documents indicate. Any relocation of outlets or equipment must be approved by the Architect.
 - 2. Include minor details not usually shown or specified, but necessary for proper installation and operation of a system or piece of equipment in work.

3.2 SUMMARY

- C. This Section includes the following electrical materials and methods:
 - 3. Supporting devices for electrical components.
 - 4. Concrete equipment bases.
 - 5. Electrical demolition.
 - 6. Cutting and patching for electrical construction.
 - 7. Touchup painting.
- D. Related sections: The following Sections contain requirements that relate to this Section:
 - 8. Division 16 Section "Wires and Cables."
 - 9. Division 16 Section "Electrical Identification."

4.3 SUBMITTALS

- E. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Coordination Drawings for electrical installation.
 - 10. Prepare Coordination Drawings according to Division 1 Section "Submittals" to a 1/4-inch-equals-1-foot (1:50) scale or larger. Detail major elements, components, and systems of electrical equipment and materials in relation to each other and to other systems, installations, and building components. Indicate locations and space requirements for installation, access, and working clearance. Show where sequence and coordination of

installations are important to the efficient flow of the Work. Coordinate drawing preparation with effort specified in other Specification Sections. Include the following:

- a. Provisions for scheduling, sequencing, moving, and positioning large equipment in the building during construction.
- b. Floor plans, elevations, and details, including the following:
 - 1) Clearances to meet safety requirements and for servicing and maintaining equipment, including space for equipment disassembly required for periodic maintenance.
 - 2) Equipment support details.
 - 3) Exterior wall, roof, and foundation penetrations of cable and raceway; and their relation to other penetrations and installations.
 - 4) Fire-rated interior wall and floor penetrations by electrical installations.
 - 5) Sizes and locations of required concrete pads and bases.
- c. Reflected ceiling plans to coordinate and integrate installing air outlets and inlets, light fixtures, alarm and communication systems components, sprinklers, and other ceiling-mounted items.

- C. Samples of color, lettering style, and other graphic representation required for each identification product for Project.

5.4 QUALITY ASSURANCE

- F. Comply with NFPA 70 for components and installation.
 - G. Listing and Labeling: Provide products specified in this Section that are listed and labeled.
11. The Terms "Listed and Labeled": As defined in the National Electrical Code, Article 100.

6.5 SEQUENCING AND SCHEDULING

- H. Coordinate electrical equipment installation with other building components.
- I. Arrange for chases, slots, and openings in building structure during progress of construction to allow for electrical installations.
- J. Coordinate installing required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- K. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning prior to closing in the building.
- L. Coordinate connecting electrical service to components furnished under other Sections.
- M. Coordinate connecting electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- N. Provide two (2) sets of complete construction drawings to power and telephone area representatives within one week of contract award.

- O. Contract includes all utility charges, labor and materials. If information is not available at bidding time, clearly state what is excluded and/or what allowance has been included.
- P. Coordinate requirements for access panels and doors where electrical items requiring access are concealed by finished surfaces. Access panels and doors are specified in Division 8 Section "Access Doors."

PART 7 - PRODUCTS

8.6 SUPPORTING DEVICES

- Q. Channel and angle support systems, hangers, anchors, sleeves, brackets, fabricated items, and fasteners are designed to provide secure support from the building structure for electrical components.
 - 12. Material: Steel, except as otherwise indicated, protected from corrosion with zinc coating or with treatment of equivalent corrosion resistance using approved alternative finish or inherent material characteristics.
 - 13. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel, except as otherwise indicated.
- R. Steel channel supports have 9/16-inch diameter holes at a maximum of 8 inches in at least 1 surface.
 - 14. Fittings and accessories mate and match with channels and are from the same manufacturer.
- C. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring steel clamps or "click"-type hangers.
- D. Sheet-Metal Sleeves: 0.0276-inch or heavier galvanized sheet steel, round tube, closed with welded longitudinal joint.
- E. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.
- F. Expansion Anchors: Carbon-steel wedge or sleeve type.
- G. Toggle Bolts: All-steel springhead type.
- H. Power-Driven Threaded Studs: Heat-treated steel.

9.7 CONCRETE EQUIPMENT BASES

- S. Forms and Reinforcing Materials: As specified in Division 3 Section "Cast-in-Place Concrete." Concrete: 3000-psi, 28-day compressive strength as specified in Division 3 Section "Cast-in-Place Concrete."

10.8 TOUCHUP PAINT

- T. For Equipment: Provided by equipment manufacturer and selected to match equipment finish.
- U. For Nonequipment Surfaces: Matching type and color of undamaged, existing adjacent finish.

- V. For Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 11 - EXECUTION

12.9 EQUIPMENT INSTALLATION REQUIREMENTS

- W. Install components and equipment to provide the maximum possible headroom where mounting heights or other location criteria are not indicated.
- X. Install items level, plumb, and parallel and perpendicular to other building systems and components, except where otherwise indicated.
- Y. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.
- Z. Give right of way to raceways and piping systems installed at a required slope.
- AA. Install access doors and panels to provide access to electrical materials and equipment.

13.10 ELECTRICAL SUPPORTING METHODS

- BB. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.
- CC. Dry Locations: Steel materials.
- DD. Support Clamps for PVC Raceways: Click-type clamp system.
- EE. Conform to manufacturer's recommendations for selecting supports.
- FF. Strength of Supports: Adequate to carry all present and future loads, times a safety factor of at least 4; 200-lb-minimum design load.

14.11 INSTALLATION

- GG. Install devices to securely and permanently fasten and support electrical components.
- HH. Raceway Supports: Comply with NFPA 70 and the following requirements:
 - 15. Conform to manufacturer's recommendations for selecting and installing supports.
 - 16. Install individual and multiple raceway hangers and riser clamps to support raceways from building structure and not from suspended ceiling support wires, except as noted below. Provide U bolts, clamps, attachments, and other hardware necessary for hanger assembly and for securing hanger rods and conduits.
 - d. Raceway directly associated with fixtures or equipment located on the suspended ceiling, and conduits not larger than 3/4" trade size serving outlets within the room under the suspended ceiling may be supported from the ceiling wire.
 - e. Support no more than two (2) conduits from the same suspended ceiling wire. Install conduits minimum of eight (8) inches above ceiling so as to not limit accessibility.
 - 17. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.

18. Spare Capacity: Size supports for multiple conduits so capacity can be increased by a 25 percent minimum in the future.
 19. Support individual horizontal raceways with separate, malleable iron pipe hangers or clamps.
 20. Hanger Rods: 1/4-inch diameter or larger threaded steel, except as otherwise indicated.
 21. Spring Steel Fasteners: Specifically designed for supporting single conduits or tubing. May be used in lieu of malleable iron hangers for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits within the same area, above suspended ceilings and for fastening raceways to channel and slotted angle supports.
 22. In vertical runs, arrange support so the load produced by the weight of the raceway and the enclosed conductors is carried entirely by the conduit supports, with no weight load on raceway terminals.
- C. Miscellaneous Supports: Install metal channel racks for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers, and other devices except where components are mounted directly to structural features of adequate strength.
- D. In open overhead spaces, cast boxes threaded to raceways need not be separately supported, except where used for fixture support; support sheet-metal boxes directly from the building structure or by bar hangers. Where bar hangers are used, attach the bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches from the box.
- E. Sleeves: Install for cable and raceway penetrations of concrete slabs and walls, except where core-drilled holes are used. Install for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.
- F. Firestopping: Apply to cable and raceway penetrations of fire-rated floor and wall assemblies. Perform firestopping as specified in Division 7 Section "Firestopping" to reestablish the original fire-resistance rating of the assembly at the penetration.
- G. Fastening: Unless otherwise indicated, securely fasten electrical items and their supporting hardware to the building structure. Perform fastening according to the following:
23. Fasten by means of wood screws or screw-type nails on wood; toggle bolts on hollow masonry units; concrete inserts or expansion bolts on concrete or solid masonry; and by machine screws, welded threaded studs, or spring-tension clamps on steel.
 24. Threaded studs driven by a powder charge and provided with lock washers and nuts may be used instead of expansion bolts, machine screws, or wood screws.
 25. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or any other items.
 26. In partitions of light steel construction use sheet-metal screws.
 27. Drill holes in concrete beams so holes more than 1-1/2 inches deep do not cut main reinforcing bars.
 28. Drill holes in concrete so holes more than 3/4 inch deep do not cut main reinforcing bars.
 29. Fill and seal holes drilled in concrete and not used.
 30. Select fasteners so the load applied to any fastener does not exceed 25 percent of the proof-test load.

- H. Install concrete pads and bases according to requirements of Division 3 Section "Cast-in-Place Concrete."

15.4 CUTTING AND PATCHING

- II. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for electrical installations. Perform cutting by skilled mechanics of the trades involved.
- JJ. Repair disturbed surfaces to match adjacent undisturbed surfaces.

16.5 TOUCHUP PAINTING

- KK. Thoroughly clean damaged areas and provide primer, intermediate, and finish coats to suit the degree of damage at each location.
- LL. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.

END OF SECTION 16050

SECTION 16050

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

2.1 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. Drawings and Data:
 - 1. Electrical drawings are generally diagrammatic and location of outlets and equipment is approximate; exact routing of raceways, locations of outlets and equipment shall be governed by structural conditions and obstructions. This is not to be construed to permit system redesign. All outlets and equipment shall be interconnected as the Contract Documents indicate. Any relocation of outlets or equipment must be approved by the Architect.
 - 2. Include minor details not usually shown or specified, but necessary for proper installation and operation of a system or piece of equipment in work.

3.2 SUMMARY

- C. This Section includes the following electrical materials and methods:
 - 3. Supporting devices for electrical components.
 - 4. Concrete equipment bases.
 - 5. Electrical demolition.
 - 6. Cutting and patching for electrical construction.
 - 7. Touchup painting.
- D. Related sections: The following Sections contain requirements that relate to this Section:
 - 8. Division 16 Section "Wires and Cables."
 - 9. Division 16 Section "Electrical Identification."

4.3 SUBMITTALS

- E. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B.
 - Coordination Drawings for electrical installation.
 - 10. Prepare Coordination Drawings according to Division 1 Section "Submittals" to a 1/4-inch-equals-1-foot (1:50) scale or larger. Detail major elements, components, and systems of electrical equipment and materials in relation to each other and to other systems, installations, and building components. Indicate locations and space requirements for installation, access, and working clearance. Show where sequence and coordination of

installations are important to the efficient flow of the Work. Coordinate drawing preparation with effort specified in other Specification Sections. Include the following:

- a. Provisions for scheduling, sequencing, moving, and positioning large equipment in the building during construction.
 - b. Floor plans, elevations, and details, including the following:
 - 1) Clearances to meet safety requirements and for servicing and maintaining equipment, including space for equipment disassembly required for periodic maintenance.
 - 2) Equipment support details.
 - 3) Exterior wall, roof, and foundation penetrations of cable and raceway; and their relation to other penetrations and installations.
 - 4) Fire-rated interior wall and floor penetrations by electrical installations.
 - 5) Sizes and locations of required concrete pads and bases.
 - c. Reflected ceiling plans to coordinate and integrate installing air outlets and inlets, light fixtures, alarm and communication systems components, sprinklers, and other ceiling-mounted items.
- C. Samples of color, lettering style, and other graphic representation required for each identification product for Project.

5.4 QUALITY ASSURANCE

- F. Comply with NFPA 70 for components and installation.
 - G. Listing and Labeling: Provide products specified in this Section that are listed and labeled.
11. The Terms "Listed and Labeled": As defined in the National Electrical Code, Article 100.

6.5 SEQUENCING AND SCHEDULING

- H. Coordinate electrical equipment installation with other building components.
- I. Arrange for chases, slots, and openings in building structure during progress of construction to allow for electrical installations.
- J. Coordinate installing required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- K. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning prior to closing in the building.
- L. Coordinate connecting electrical service to components furnished under other Sections.
- M. Coordinate connecting electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- N. Provide two (2) sets of complete construction drawings to power and telephone area representatives within one week of contract award.

- O. Contract includes all utility charges, labor and materials. If information is not available at bidding time, clearly state what is excluded and/or what allowance has been included.
- P. Coordinate requirements for access panels and doors where electrical items requiring access are concealed by finished surfaces. Access panels and doors are specified in Division 8 Section "Access Doors."

PART 7 - PRODUCTS

8.6 SUPPORTING DEVICES

- Q. Channel and angle support systems, hangers, anchors, sleeves, brackets, fabricated items, and fasteners are designed to provide secure support from the building structure for electrical components.
 - 12. Material: Steel, except as otherwise indicated, protected from corrosion with zinc coating or with treatment of equivalent corrosion resistance using approved alternative finish or inherent material characteristics.
 - 13. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel, except as otherwise indicated.
- R. Steel channel supports have 9/16-inch diameter holes at a maximum of 8 inches in at least 1 surface.
 - 14. Fittings and accessories mate and match with channels and are from the same manufacturer.
- C. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring steel clamps or "click"-type hangers.
- D. Sheet-Metal Sleeves: 0.0276-inch or heavier galvanized sheet steel, round tube, closed with welded longitudinal joint.
- E. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.
- F. Expansion Anchors: Carbon-steel wedge or sleeve type.
- G. Toggle Bolts: All-steel springhead type.
- H. Power-Driven Threaded Studs: Heat-treated steel.

9.7 CONCRETE EQUIPMENT BASES

- S. Forms and Reinforcing Materials: As specified in Division 3 Section "Cast-in-Place Concrete." Concrete: 3000-psi, 28-day compressive strength as specified in Division 3 Section "Cast-in-Place Concrete."

10.8 TOUCHUP PAINT

- T. For Equipment: Provided by equipment manufacturer and selected to match equipment finish.
- U. For Nonequipment Surfaces: Matching type and color of undamaged, existing adjacent finish.

- V. For Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 11 - EXECUTION

12.9 EQUIPMENT INSTALLATION REQUIREMENTS

- W. Install components and equipment to provide the maximum possible headroom where mounting heights or other location criteria are not indicated.
- X. Install items level, plumb, and parallel and perpendicular to other building systems and components, except where otherwise indicated.
- Y. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.
- Z. Give right of way to raceways and piping systems installed at a required slope.
- AA. Install access doors and panels to provide access to electrical materials and equipment.

13.10 ELECTRICAL SUPPORTING METHODS

- BB. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.
- CC. Dry Locations: Steel materials.
- DD. Support Clamps for PVC Raceways: Click-type clamp system.
- EE. Conform to manufacturer's recommendations for selecting supports.
- FF. Strength of Supports: Adequate to carry all present and future loads, times a safety factor of at least 4; 200-lb-minimum design load.

14.11 INSTALLATION

- GG. Install devices to securely and permanently fasten and support electrical components.
- HH. Raceway Supports: Comply with NFPA 70 and the following requirements:
 - 15. Conform to manufacturer's recommendations for selecting and installing supports.
 - 16. Install individual and multiple raceway hangers and riser clamps to support raceways from building structure and not from suspended ceiling support wires, except as noted below. Provide U bolts, clamps, attachments, and other hardware necessary for hanger assembly and for securing hanger rods and conduits.
 - d. Raceway directly associated with fixtures or equipment located on the suspended ceiling, and conduits not larger than 3/4" trade size serving outlets within the room under the suspended ceiling may be supported from the ceiling wire.
 - e. Support no more than two (2) conduits from the same suspended ceiling wire. Install conduits minimum of eight (8) inches above ceiling so as to not limit accessibility.
 - 17. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.

18. Spare Capacity: Size supports for multiple conduits so capacity can be increased by a 25 percent minimum in the future.
 19. Support individual horizontal raceways with separate, malleable iron pipe hangers or clamps.
 20. Hanger Rods: 1/4-inch diameter or larger threaded steel, except as otherwise indicated.
 21. Spring Steel Fasteners: Specifically designed for supporting single conduits or tubing. May be used in lieu of malleable iron hangers for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits within the same area, above suspended ceilings and for fastening raceways to channel and slotted angle supports.
 22. In vertical runs, arrange support so the load produced by the weight of the raceway and the enclosed conductors is carried entirely by the conduit supports, with no weight load on raceway terminals.
- C. Miscellaneous Supports: Install metal channel racks for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers, and other devices except where components are mounted directly to structural features of adequate strength.
- D. In open overhead spaces, cast boxes threaded to raceways need not be separately supported, except where used for fixture support; support sheet-metal boxes directly from the building structure or by bar hangers. Where bar hangers are used, attach the bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches from the box.
- E. Sleeves: Install for cable and raceway penetrations of concrete slabs and walls, except where core-drilled holes are used. Install for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.
- F. Firestopping: Apply to cable and raceway penetrations of fire-rated floor and wall assemblies. Perform firestopping as specified in Division 7 Section "Firestopping" to reestablish the original fire-resistance rating of the assembly at the penetration.
- G. Fastening: Unless otherwise indicated, securely fasten electrical items and their supporting hardware to the building structure. Perform fastening according to the following:
23. Fasten by means of wood screws or screw-type nails on wood; toggle bolts on hollow masonry units; concrete inserts or expansion bolts on concrete or solid masonry; and by machine screws, welded threaded studs, or spring-tension clamps on steel.
 24. Threaded studs driven by a powder charge and provided with lock washers and nuts may be used instead of expansion bolts, machine screws, or wood screws.
 25. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or any other items.
 26. In partitions of light steel construction use sheet-metal screws.
 27. Drill holes in concrete beams so holes more than 1-1/2 inches deep do not cut main reinforcing bars.
 28. Drill holes in concrete so holes more than 3/4 inch deep do not cut main reinforcing bars.
 29. Fill and seal holes drilled in concrete and not used.
 30. Select fasteners so the load applied to any fastener does not exceed 25 percent of the proof-test load.

- H. Install concrete pads and bases according to requirements of Division 3 Section "Cast-in-Place Concrete."

15.4 CUTTING AND PATCHING

- II. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for electrical installations. Perform cutting by skilled mechanics of the trades involved.
- JJ. Repair disturbed surfaces to match adjacent undisturbed surfaces.

16.5 TOUCHUP PAINTING

- KK. Thoroughly clean damaged areas and provide primer, intermediate, and finish coats to suit the degree of damage at each location.
- LL. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.

END OF SECTION 16050

SECTION 16100
RACEWAYS, BOXES, AND CABINETS

PART 1 - GENERAL

2.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

3.2 SUMMARY

- B. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
- C. Raceways include the following:
 - 1. Rigid metal conduit.
 - 2. Intermediate metal conduit.
 - 3. Electrical metallic tubing (EMT).
 - 4. Flexible metal conduit.
 - 5. Liquidtight flexible conduit.
 - 6. Rigid nonmetallic conduit.
 - 7. Wireway.
 - 8. Surface raceways.
- D. Boxes, enclosures, and cabinets include the following:
 - 9. Device boxes.
 - 10. Floor boxes.
 - 11. Outlet boxes.
 - 12. Pull and junction boxes.
 - 13. Cabinets and hinged cover enclosures.

- E. Related Sections: The following Sections contain requirements that relate to this Section:
 - 14. Division 7 Section "Firestopping."
 - 15. Division 16 Section "Cable Trays."
 - 3. Division 16 Section "Underground Ducts and Utility Structures."
 - 4. Division 16 Section "Wiring Devices" for devices installed in boxes and floor box service fittings.

4.3 SUBMITTALS

- F. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.
- G. Product data for surface raceway, wireway and fittings, floor boxes, hinged cover enclosures, and cabinets.

5.4 QUALITY ASSURANCE

- H. Comply with NFPA 70 "National Electrical Code" for components and installation.
- I. NEMA Compliance: Comply with applicable requirements of NEMA standards pertaining to raceways.
- J. UL Compliance and Labeling: Comply with applicable requirements of UL standards pertaining to electrical raceway systems. Provide raceway products and components listed and labeled by UL, ETL, or CSA.
- K. Comply with NECA "Standard of Installation".
- L. Coordinate layout and installation of raceway and boxes with other construction elements to ensure adequate headroom, working clearance, and access.
- M. Coordinate with other Work, including metal and concrete deck installation, as necessary to interface installation of electrical raceways and components with other Work.

PART 6 - PRODUCTS

7.5 MANUFACTURERS

- N. Available Manufacturers: Subject to compliance with requirements, manufacturers offering Products that may be incorporated in the Work include, but are not limited to, the following:
 - 16. Metal Conduit and Tubing:
 - a. Allied Tube and Conduit, Grinnell Co.
 - b. Anixter Brothers, Inc.

- c. Flexcon, Inc., Coleman Cable Systems, Inc.
 - d. Spiraduct, Inc.
 - e. Triangle PWC, Inc.
 - f. Wheatland Tube Co.
17. Nonmetallic Tubing and Conduit:
- g. Anamet, Inc., Anaconda Metal Hose.
 - h. Carlon.
 - i. Certainteed Corp, Pipe & Plastics Group.
 - j. Condux International, Electrical Products.
 - k. Thomas & Betts Corp.
18. Conduit Bodies and Fittings:
- l. American Electric, Construction Materials Group.
 - m. Emerson Electric Co., Appleton Electric Co.
 - n. Carlon.
 - o. Hubbell, Inc., Killark Electric Manufacturing Co.
 - p. General Signal, O-Z/Gedney Unit.
 - q. Spring City Electrical Manufacturing Co.
 - r. Reagel Manufacturing Co.
19. Wireway:
- s. Hoffman Engineering Co.
 - t. Keystone/Rees, Inc.
 - u. Square D Co.
20. Surface Metal Raceway:
- v. Airey-Thompson Co., Inc., A-T Power Systems.
 - w. Butler Manufacturing Co., Walker Division.
 - x. The Wiremold Co., Electrical Sales Division.
21. Boxes, Enclosures, and Cabinets:
- y. Butler Manufacturing Co., Walker Division.
 - z. Cooper Industries, Midwest Electric.

- aa. Erickson Electrical Equipment Co.
- bb. American Electric, FL Industries.
- cc. Hoffman Engineering Co., Federal-Hoffman, Inc.
- dd. Hubbell Inc., Killark Electric Manufacturing Co.
- ee. General Signal, O-Z/Gedney.
- ff. Racor, Inc., Hubbell Inc.
- gg. Robroy Industries, Inc., Electrical Division.
- hh. Spring City Electrical Manufacturing Co.
- ii. Square D Co.
- jj. Thomas & Betts Corp.

8.6 METAL CONDUIT AND TUBING

- O. Rigid Steel Conduit: ANSI C80.1.
- B. Intermediate Metal Conduit: ANSI C80.6.
- C. Electrical Metallic Tubing and Fittings: ANSI C80.3 with compression-type fittings.D. Flexible Metal Conduit: Zinc-coated steel.
- E. Liquidtight Flexible Metal Conduit: Flexible steel conduit with PVC jacket.
- F. Fittings: NEMA FB 1, compatible with conduit/tubing materials.

9.7 NONMETALLIC CONDUIT

- P. Rigid Nonmetallic Conduit (RNC): NEMA TC 2, Schedule 40 or 80 PVC.
- Q. PVC Conduit and Tubing Fittings: NEMA TC 3; match to conduit or conduit/tubing type and material.

10.8 WIREWAYS

- R. Material: Sheet metal sized and shaped as indicated, without knockouts..
- S. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireway as required for complete system.
- T. Select features where not otherwise indicated, as required to complete wiring system and to comply with NEC.

11.9 SURFACE RACEWAY

- U. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceway.
- V. Surface Metal Raceway: Galvanized steel with snap-on covers. Finish with manufacturer's standard prime coating suitable for painting.

12.10 OUTLET AND DEVICE BOXES

- W. Sheet Metal Boxes: NEMA OS 1.
22. Minimum size 4 inch square by 2-1/4 inches deep.
- X. Cast Metal Boxes: NEMA FB 1, type FD, cast ferrous alloy box with gasketed cover.

13.11 FLOOR BOXES

- Y. Floor Box: Galvanized sheet steel, fully adjustable, rectangular.

23. Product: Steel City Series 664 with suitable cover.

14.12 PULL AND JUNCTION BOXES

- Z. Small Sheet Metal Boxes: NEMA OS 1.
- AA. Cast Metal Boxes: NEMA FB 1, cast steel with gasketed cover.
- C. Underground: Precast or concrete with traffic rated cover if in traffic area.

15.13 CABINETS AND ENCLOSURES

- BB. Hinged Cover Enclosures: NEMA 250, steel enclosure with continuous hinge cover and flush latch. Finish inside and out with manufacturer's standard enamel.
- CC. Cabinets: NEMA 250, type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage, and include accessory feet where required for freestanding equipment.

PART 16 - EXECUTION

17.14 EXAMINATION

- DD. Examine surfaces to receive raceways, boxes, enclosures, and cabinets for compliance with installation tolerances and other conditions affecting performance of the raceway system. Do not proceed with installation until unsatisfactory conditions have been corrected.

18.15 WIRING METHODS

- EE. Outdoors: Use the following wiring methods:

- 24. Exposed: Rigid or intermediate metal conduit.
- 25. Concealed: Rigid or intermediate metal conduit.
- 26. Underground, Single Run: Rigid nonmetallic conduit.
- 27. Underground, Grouped: Rigid nonmetallic conduit.
- 28. Connection to Vibrating Equipment (including transformers and hydraulic, pneumatic, or electric solenoid or motor-driven equipment): Liquidtight flexible metal conduit.
- 29. Boxes and Enclosures: NEMA Type 3R or Type 4.

FF. Indoors: Use the following wiring methods:

- 30. Connection to Vibrating Equipment (including transformers and hydraulic, pneumatic, or electric solenoid or motor-driven equipment): Flexible metal conduit, except in wet or damp locations use liquidtight flexible metal conduit.
- 31. Damp or Wet Locations: Rigid steel conduit.
- 32. Exposed: Electrical metallic tubing or rigid metal conduit.
- 33. Concealed: Electrical metallic tubing.
- 34. Boxes and Enclosures: NEMA Type 1, except in damp or wet locations use NEMA Type 4, stainless steel.
- 35. Concealed in concrete or masonry walls: Rigid steel conduit or rigid non-metallic conduit.

19.16 INSTALLATION

- GG. Install raceways, boxes, enclosures, and cabinets as indicated, according to manufacturer's written instructions.
- HH. Install a separate ground wire in all raceways.
- II. Minimum conduit size: 3/4 inch
- JJ. Conceal conduit and EMT, unless otherwise indicated, within finished walls, ceilings, and floors.
- KK. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot water pipes. Install horizontal raceway runs above water and steam piping.
- LL. Install raceways level and square and at proper elevations. Provide adequate headroom.
- MM. Complete raceway installation before starting conductor installation.
- NN. Support raceway as specified in Division 16 Section "Supporting Devices."
- OO. Use temporary closures to prevent foreign matter from entering raceway.

- PP. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portion of bends is not visible above the finished slab.
- QQ. Make bends and offsets so the inside diameter is not reduced. Unless otherwise indicated, keep the legs of a bend in the same plane and the straight legs of offsets parallel.
- RR. Use raceway fittings compatible with raceway and suitable for use and location. For intermediate steel conduit, use threaded rigid steel conduit fittings, except as otherwise indicated.
- SS. Run concealed raceways with a minimum of bends in the shortest practical distance considering the type of building construction and obstructions, except as otherwise indicated.
- TT. Raceways Embedded in Slabs: Install in middle third of the slab thickness where practical, and leave at least 1 inch concrete cover.
36. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
37. Space raceways laterally to prevent voids in the concrete.
38. Run conduit larger than 1-inch trade size parallel to or at right angles to main reinforcement. When at right angles to reinforcement, place conduit close to slab support.
39. Transition nonmetallic conduit to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above floor.
- UU. Install exposed raceways parallel to or at right angles to nearby surfaces or structural members, and follow the surface contours as much as practical.
40. Run parallel or banked raceways together, on common supports where practical.
41. Make bends in parallel or banked runs from same center line to make bends parallel. Use factory elbows only where they can be installed parallel; otherwise, provide field bends for parallel raceways.
42. Install expansion fittings in all raceways at building expansion joints.
- VV. Raceways under slabs and underground:
43. Curves and bends: Use rigid steel conduit half-lap wrapped with corrosion protective tape.
44. Depth: Minimum 24 inches below finished grade.
45. Minimum size: 1 inch except for single floor outlets 3/4 inch.
46. Transition non-metallic conduit to rigid steel before rising above grade on floor.
47. Protect conduit with half-lap wrapping with corrosion protective tape for 3 inches minimum both sides of transition point.
- WW. Join raceways with fittings designed and approved for the purpose and make joints tight.
48. Make raceway terminations tight. Use bonding bushings or wedges at connections subject to vibration. Use bonding jumpers where joints cannot be made tight.

- 49. Use insulating bushings to protect conductors.
- XX. Set screw fittings not permitted unless authorized by owner.
- YY. Terminations: Where raceways are terminated with locknuts and bushings, align the raceway to enter squarely, and install the locknuts with dished part against the box. Where terminations cannot be made secure with one locknut, use two locknuts, one inside and one outside the box.
- ZZ. Where terminating in threaded hubs, screw the raceway or fitting tight into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align the raceway so the coupling is square to the box, and tighten the chase nipple so no threads are exposed.
- AAA. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line having not less than 200-lb (90 kg) tensile strength. Leave not less than 12 inches of slack at each end of the pull wire.
- BBB. Telephone and Signal System Raceways 2-Inch Trade Size and Smaller: In addition to the above requirements, install in maximum lengths of 150 feet (45 m) and with a maximum of two 90-deg bends or equivalent. Install pull or junction boxes where necessary to comply with these requirements.
- CCC. Install raceway sealing fittings according to the manufacturer's written instructions. Locate fittings at suitable, approved, accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points and elsewhere as indicated:
 - 50. Where conduits enter or leave hazardous locations.
 - 51. Where conduits pass from warm locations to cold locations, such as the boundaries of refrigerated spaces and air-conditioned spaces.
 - 52. Where otherwise required by the NEC.
- DDD. Stub-Up Connections: Extend conduits through concrete floor for connection to freestanding equipment with an adjustable top or coupling threaded inside for plugs, and set flush with the finished floor. Extend conductors to equipment with rigid steel conduit; flexible metal conduit may be used 6 inches above the floor. Where equipment connections are not made under this Contract, install screwdriver-operated threaded flush plugs flush with floor.

Extend rigid steel conduits to all panel and cabinets with locknuts both inside and outside of the box. Provide insulated grounding bushings on all feeder conduits.
- EEE. Flexible Connections: Use maximum of 6 feet of flexible conduit for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors and transformers. Use liquidtight flexible conduit in wet or damp locations. Install separate ground conductor across flexible connections.
- FFF. Surface Metal Raceway: Install a separate green ground conductor in raceway from the junction box supplying the raceway to receptacle or fixture ground terminals.⁵³ Select each surface metal raceway outlet box to which a lighting fixture is attached to be of sufficient diameter to provide a seat for the fixture canopy.
 - 54. Where a surface metal raceway is used to supply a fluorescent lighting fixture having central stem suspension with a backplate and a canopy (with or without extension ring),

the backplate and canopy will serve as the outlet box and no separate outlet box need be provided.

- 55. Provide surface metal raceway outlet box, in addition to the backplate and canopy, at the feed-in location of each fluorescent lighting fixture having end stem suspension.
- 56. Where a surface metal raceway extension is made from an existing outlet box on which a lighting fixture is installed (provide a backplate slightly smaller than the fixture canopy), no additional surface mounted outlet box need be installed.

GGG. Set floor boxes level and adjust to floor surface.

HHH. Install hinged cover enclosures and cabinets plumb. Support at each corner.

III. Provide grounding connections for raceway, boxes, and components as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals according to tightening torques specified in UL Standard 486A.

Full height demountable partitions: serve from above ceiling with flexible conduit within the partition.

JJJ. Outlet and Device Boxes

- 57. Flush mount with plaster rings in all finished areas.
- 58. Offset all boxes that are back to back in the same wall.
- 59. Coordinate location of boxes above counter splashes and built-ins.

20.17 PROTECTION

KKK. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, to ensure that coatings, finishes, and cabinets are without damage or deterioration at Substantial Completion.

- 60. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
- 61. Repair damage to PVC or paint finishes with matching touch-up coating recommended by the manufacturer.

LLL. Upon completion of installation of system, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

END OF SECTION 16100

SECTION 16140
WIRING DEVICES

PART 1 - GENERAL

2.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

3.2 SUMMARY

- B. This Section includes various types of receptacles, connectors, switches, and finish plates.

4.3 SUBMITTALS

- C. Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.
- D. Product data for each product specified.
- E. Operation and maintenance data for materials and products specified in this Section to include in the "Operating and Maintenance Manual" specified in Division 1.

5.4 QUALITY ASSURANCE

- F. Comply with NFPA 70 "National Electrical Code" for devices and installation.
- G. Listing and Labeling: Provide products that are listed and labeled for their applications and installation conditions and for the environments in which installed.
 - 1. The Terms "Listed" and "Labeled": As defined in the "National Electrical Code," Article 100.

6.5 COORDINATION

- H. Wiring Devices for Owner Furnished Equipment: Match devices to plug connectors for Owner-furnished equipment.
- I. Cord and Plug Sets: Match cord and plug sets to equipment requirements.

PART 7 - PRODUCTS

8.6 MANUFACTURERS

- J. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

- K. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2. Wiring Devices:
 - a. Hubbell Inc.
 - b. Leviton Mfg. Co., Inc.
 - c. Eagle
 3. Wiring Devices for Hazardous (Classified) Locations:
 - a. Crouse-Hinds Electrical Construction.
 - b. Killark Electrical Mfg. Co.
 - c. Pyle-National Co.
 4. Exterior/Wet Location Plates:
 - d. TayMac
 - e. C.W. Cole & Co., Inc.
 5. Multi-Outlet Assemblies:
 - f. Airey-Thompson Co., Inc.
 - g. Wiremold Co.
 6. Poke-Through and Telephone/Power Poles:
 - h. Hubbell, Inc.
 - i. Pass & Seymour/LeGrand.
 - j. Walker Div., Butler Mfg. Co.
 - k. Wiremold Co.
 7. Floor Service Outlets:
 - l. Steel City

9.7 WIRING DEVICES

- L. Comply with NEMA Standard WD 1, "General Purpose Wiring Devices."
- M. Enclosures: NEMA 1 equivalent, except as otherwise indicated.
- N. Color: Ivory except as otherwise indicated or required by Code.
- O. Color: Red for devices connect to emergency circuits.
- P. Receptacles, Straight-Blade and Locking Type: Comply with UL Standard 498, "Electrical Attachment Plugs and Receptacles," heavy-duty grade except as otherwise indicated.

- Q. Receptacles, Straight-Blade, Hospital Grade: Listed and labeled for compliance with Hospital Grade of UL Standard 498, "Electrical Attachment Plug and Receptacle," and Federal Specification W-C-598.
- R. Receptacles, Straight-Blade, Special Features: Comply with the basic requirements specified above for straight-blade receptacles of the class and type indicated, and with the following additional requirements:
 - 8. Ground-Fault Circuit Interrupter (GFCI) Receptacles: UL Standard 943, "Ground Fault Circuit Interrupters," feed-through type, with integral NEMA 5-20R duplex receptacle arranged to protect connected downstream receptacles on the same circuit. Design units for installation in a 2-3/4-inch deep outlet box without an adapter.
 - 9. Isolated Ground Receptacles: Equipment grounding contacts are connected only to the green grounding screw terminal of the device and have inherent electrical isolation from the mounting strap.
 - m. Devices: Listed and labeled as isolated ground receptacles.
 - n. Isolation Method: Integral to the receptacle construction and not dependent on removable parts.
 - o. Color: Orange
 - 10. Transient-Voltage Surge-Suppressor (TVSS) Receptacles: Duplex type, NEMA 5-20R configuration, with integral transient-voltage surge protection in a minimum of 3 modes: line-to-ground, line-to-neutral, and neutral-to-ground; listed as complying with UL Standard 1449 "Transient Voltage Surge Suppressors."
 - p. Surge Protection Components: Multiple metal-oxide varistors, rated for 500 V transient suppression voltage nominal clamp level and minimum single transient pulse energy dissipation of 140 J, line-to-neutral, and 70 J, line-to-ground and neutral-to-ground.
 - q. Active Protection Indication: A light visible in the face of the device indicates the state of the device as "active" or "no longer active."
 - r. Identification: Distinctive marking on face of device denotes transient-voltage surge-suppressor type unit.
 - s. Color: Blue
- S. Receptacles, Industrial Heavy-Duty: Conform to NEMA Standard PK 4 "Plugs, Receptacles, and Cable Connectors of the Pin and Sleeve Type for Industrial Use."
- T. Receptacles in Hazardous (Classified) Locations: Comply with NEMA Standard FB 11 "Plugs, Receptacles, and Connectors of the Pin and Sleeve Type for Hazardous Locations" and UL Standard 1010 "Receptacle-Plug Combinations for Use in Hazardous (Classified) Locations."
- U. Pendant Cord/Connector Devices: Matching, locking type, plug and plug receptacle body connector, NEMA L5-20P and L5-20R, heavy-duty grade.
 - 11. Bodies: Nylon with screw-open cable-gripping jaws and provision for attaching external cable grip.
 - 12. External Cable Grip: Woven wire mesh type made of high-strength galvanized-steel wire strand and matched to cable diameter and with attachment provision designed for the

corresponding connector.

- V. Cord and Plug Sets: Match voltage and current ratings and number of conductors to requirements of the equipment being connected.
 - 13. Cord: Rubber-insulated, stranded copper conductors, with type SOW-A jacket. Grounding conductor has green insulation. Ampacity is equipment rating plus 30 percent minimum.
 - 14. Plug: Male configuration with nylon body and integral cable-clamping jaws. Match to cord and to receptacle type intended for connection.
- W. Snap Switches: Quiet-type a.c. switches, NRTL listed and labeled as complying with UL Standard 20 "General Use Snap Switches," and with Federal Specification W-S-896.
- X. Snap Switches in Hazardous (Classified) Locations: Comply with UL Standard 894, "Switches for Use in Hazardous (Classified) Locations."
- Y. Dimmer Switches: Modular full-wave solid-state units with integral, quiet on-off switches, and audible and electromagnetic noise filters.
 - 15. Wattage rating exceeds connected load by 30 percent minimum, except as otherwise indicated.
 - 16. Control: Continuously adjustable slide, toggle or rotary knob. Single-pole or 3-way switch to suit connections.
 - 17. Incandescent Lamp Dimmers: Modular dimmer switches for incandescent fixtures; switch poles and wattage as otherwise indicated, 120 V, 60 Hz with continuously adjustable rotary knob, toggle, or slide, single-pole with soft tap or other quiet switch. Equip with electromagnetic filter to eliminate noise, RF and TV interference, and 5-inch wire connecting leads.
 - 18. Fluorescent Lamp Dimmers: Modular dimmer switches compatible with dimmer ballasts. Trim potentiometer adjusts low-end dimming. Dimmer-ballast combination is capable of consistent dimming to a maximum of 10 percent of full brightness.
- Z. Telephone Jack: 8-position, modular, latching-plug type, flush in face of wall plated.
- AA. Telephone Jack: 4-position, modular, latching-plug type, flush in face of wall plate.
- BB. Wall Plates: Single and combination types that mate and match with corresponding wiring devices. Features include the following:
 - 19. Color: Matches wiring device except as otherwise indicated.
 - 20. Plate-Securing Screws: Metal with heads colored to match plate finish.
 - 21. Material for Finished Spaces: Steel with wrinkled finish, white baked enamel, suitable for field painting, except as otherwise indicated.
 - 22. Material for Finished Spaces: 0.04-inch-thick, type 302, satin-finished stainless steel, except as otherwise indicated.
 - 23. Material for Finished Spaces: 0.04-inch-thick brushed brass with factory polymer finish, except as otherwise indicated.
 - 24. Material for Finished Spaces: 0.04-inch-thick brass, satin chrome plated, except as

otherwise indicated.

- 25. Material for Finished Spaces: 0.05-inch-thick anodized aluminum, except as otherwise indicated.
- 26. Material for Finished Spaces: Ivory, Smooth Plastic.
- 27. Material for Unfinished Spaces: Galvanized steel.
- 28. Material for Unfinished Spaces: Smooth plastic.
- CC. Material for exterior and set locations:
 - 29. Material: Polycarbonate or cast aluminum door.
 - 30. Listing: "Suitable for wet locations while in use".
 - 31. Locking: Tumble lock, keyed alike.

10.8 FLOOR SERVICE OUTLET ASSEMBLIES

- DD. Types: In-floor, dual-service units suitable for the wiring method used.
- EE. Compartmentation: Barrier separates power and signal compartments.
- FF. Housing Material: Galvanized steel.
- GG. Power Receptacle: NEMA configuration 5-20R, ivory finish, except as otherwise indicated.
- HH. Signal Outlet: Blank cover with bushed cable opening, except as otherwise indicated.
- II. Finish Cover: Steel with non-metallic trim.

11.9 POKE-THROUGH ASSEMBLIES

- JJ. Description: Factory-fabricated and -prewired assembly of below-floor junction box unit with multichanneled, through-floor raceway/firestop unit and detachable mating floor service outlet assembly as specified above. Features include the following:
 - 32. Size: Selected to fit nominal 3-inch cored holes in the floor and matched to the floor thickness.
 - 33. Fire Rating: Unit is listed and labeled to match the fire rating of the floor.
 - 34. Closure Plug: Arranged to close unused 3-inch cored openings and reestablish the fire rating of the floor.
 - 35. Wiring: Three No. 12 AWG power and ground conductors, one 75-ohm coaxial telephone/data cable, and one 4-pair 75-ohm telephone/data cable, except as otherwise indicated.

12.10 MULTI-OUTLET ASSEMBLIES

- KK. Comply with Standard UL 5, "Surface Metal Raceways and Fittings."
- LL. Components of Assemblies: Products of a single manufacturer designed to be used together to

provide a complete matching assembly of raceways and receptacles.

MM. Raceway Material: Metal, with manufacturer's standard corrosion-resistant finish.

NN. Wire: No. 12 AWG.

13.11 TELEPHONE/POWER SERVICE POLES

00. Description: Factory-assembled and -wired units designed to extend power, telephone, and data service from distribution wiring concealed in the ceiling to devices or outlets in the pole near the floor. Features include the following:

36. Poles: Nominal 2.5-inch-square cross section, with height adequate to extend from floor to at least 6 inches above ceiling. Separate channels for power and signal wiring.

37. Mounting Provisions: Ceiling trim flange with concealed bracing arranged for positive connection to ceiling support members. Pole foot with carpet pad attachment.

38. Finishes: Manufacturer offers a minimum of 6 finish and trim combinations, including painted and satin anodized aluminum finishes and wood grain type trim. Furnish with final finish as selected from samples.

39. Wiring: Three No. 12 AWG power and ground conductors, one 75-ohm coaxial telephone/data cable, and one 4-pair 75-ohm telephone/data cable except as otherwise indicated.

40. Power Receptacles: Two single, 20-ampere, heavy-duty NEMA 5-20R units except as otherwise indicated.

41. Signal Outlets: Blank insert with bushed cable opening except as otherwise indicated.

PART 14 - EXECUTION

15.12 INSTALLATION

PP. Install devices and assemblies plumb and secure.

QQ. Install wall plates when painting is complete.

RR. Exterior Receptacles: Mount outlet box recessed 2 inches from finished surface with gasketing between enclosure and finish surface.

SS. Arrangement of Devices: Except as otherwise indicated, mount flush, with long dimension vertical, and grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates. Above countertop mount horizontal.

TT. Protect devices and assemblies during painting.

UU. Adjust locations at which floor service outlets and telephone/power service poles are installed to suit the indicated arrangement of partitions and furnishings.

VV. Install GFCI receptacles at all exterior, toilets, wet locations, and within 6 feet of a sink.

16.13 IDENTIFICATION

WW. Comply with Division 16 Section "Electrical Identification."

42. Switches: Where 3 or more switches are ganged, and elsewhere where indicated, identify each switch with approved legend engraved on wall plate.

43. Receptacles: Identify the panelboard and circuit number from which served. Use machine-printed, pressure-sensitive, abrasion-resistant label tape on face of plate and durable wire markers or tags within outlet boxes.

17.14 GROUNDING

XX. Isolated Ground Receptacles: Connect to isolated grounding conductor routed to designated isolated equipment ground terminal of electrical system.

18.15 FIELD QUALITY CONTROL

YY. Testing: Test wiring devices for proper polarity and ground continuity. Operate each operable device at least 6 times.

ZZ. Check TVSS receptacle indicating lights for normal indication.

AAA. Test ground-fault circuit interrupter operation with local fault simulations according to manufacturer recommendations.

BBB. Replace damaged or defective components.

19.16 CLEANING

CCC. General: Internally clean devices, device outlet boxes, and enclosures. Replace stained or improperly painted wall plates or devices.

END OF SECTION 16140

SECTION 16195

ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

2.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

3.2 SUMMARY

- B. This Section includes identification of electrical materials, equipment, and installations.

4.3 SUBMITTALS

- C. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- D. Product Data for each type of product specified.

5.4 QUALITY ASSURANCE

- E. Comply with NFPA 70.

6.5 SEQUENCING AND SCHEDULING

- F. Coordinate installing electrical identification after completion of finishing where identification is applied to field-finished surfaces.
- G. Coordinate installing electrical identifying devices and markings prior to installing acoustical ceilings and similar finishes that conceal such items.

PART 7 - PRODUCTS

8.6 MANUFACTURERS

- H. Available Manufacturers: Subject to compliance with requirements.

9.7 RACEWAY AND CABLE LABELS

- I. Manufacturer's Standard Products: Where more than one type is listed for a specified application, selection is Installer's option, but provide single type for each application category. Use colors prescribed by ANSI A13.1, NFPA 70, and these Specifications.

- J. Conform to ANSI A13.1, Table 3, for minimum size of letters for legend and minimum length of color field for each raceway or cable size.
 - 1. Color: Black legend on orange field.
 - 2. Legend: Indicates voltage and service.
- K. Adhesive Labels: Preprinted, flexible, self-adhesive vinyl. Legend is overlaminated with a clear, weather- and chemical-resistant coating.
- L. Pretensioned, Wraparound Plastic Sleeves: Flexible, preprinted, color-coded, acrylic bands sized to suit the diameter of the line it identifies and arranged to stay in place by pretensioned gripping action when placed in position.
- M. Colored Adhesive Tape: Self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.
- N. Underground Line Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape with the following features:
 - 3. Size: Not less than 6 inches wide by 4 mils thick.
 - 4. Compounded for permanent direct-burial service.
 - 5. Embedded continuous metallic strip or core.
 - 6. Printed Legend: Indicates type of underground line.
- O. Tape Markers: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.

10.8 ENGRAVED NAMEPLATES AND SIGNS

- P. Manufacturer's Standard Products: Where more than one type is listed for a specified application, selection is Installer's option, but provide single type for each application category. Use colors prescribed by ANSI A13.1, NFPA 70, and these Specifications.Q. Engraving stock, melamine plastic laminate, 1/16-inch minimum thick for signs up to 20 sq. in., 1/8 inch thick for larger sizes.
 - 7. Engraved Legend: Black letters on white face.
 - 8. Punched for mechanical fasteners.
- C. Fasteners for Plastic-Laminated and Metal Signs: Self-tapping stainless-steel screws or No. 10/32 stainless-steel machine screws with nuts and flat and lock washers.

11.9 MISCELLANEOUS IDENTIFICATION PRODUCTS

- R. Cable Ties: Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties with the following features:
 - 9. Minimum Width: 3/16 inch.
 - 10. Tensile Strength: 50 lb minimum.
 - 11. Temperature Range: Minus 40 to 185 deg F.
 - 12. Color: As indicated where used for color coding.

- S. Paint: Alkyd-urethane enamel over primer as recommended by enamel manufacturer.

PART 12 - EXECUTION

13.10 INSTALLATION

- T. Install identification devices according to manufacturer's written instructions.
- U. Install labels where indicated and at locations for best convenience of viewing without interference with operation and maintenance of equipment.
- V. Lettering, Colors, and Graphics: Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations used in the Contract Documents or required by codes and standards. Use consistent designations throughout the Project.W. Sequence of Work: Where identification is to be applied to surfaces that require finish, install identification after completion of finish work.
- X. Self-Adhesive Identification Products: Clean surfaces of dust, loose material, and oily films before applying.
- F. Install painted identification as follows:
 - 13. Clean surfaces of dust, loose material, and oily films before painting.
 - 14. Prime Surfaces: For galvanized metal, use single-component, acrylic vehicle coating formulated for galvanized surfaces. For concrete masonry units, use heavy-duty, acrylic-resin block filler. For concrete surfaces, use clear, alkali-resistant, alkyd binder-type sealer.
 - 15. Apply one intermediate and one finish coat of silicone alkyd enamel.
 - 16. Apply primer and finish materials according to manufacturer's instructions.
- G. Install Circuit Identification Labels on Boxes: Label externally as follows:
 - 17. Exposed Boxes: Pressure-sensitive, self-adhesive plastic label on cover.
 - 18. Concealed Boxes: Permanent marker, legibly denoted on cover.
 - 19. Labeling Legend: Permanent, waterproof listing of panel and circuit number or equivalent.
- H. Identify Paths of Underground Electrical Lines: During trench backfilling, for exterior underground power, control, signal, and communications lines, install continuous underground plastic line marker located directly above line at 6 to 8 inches below finished grade. Where multiple lines installed in a common trench or concrete envelope do not exceed an overall width of 16 inches, use a single line marker.
- I. Color-Code Conductors: Secondary service, feeder, and branch circuit conductors throughout the secondary electrical system.
 - 20. 208/120-V System: As follows:
 - a. Phase A: Black.
 - b. Phase B: Red.
 - c. Phase C: Blue.

- d. Neutral: White.
 - e. Ground: Green.
21. 480/277-V System: As follows:
- f. Phase A: Brown.
 - g. Phase B: Orange.
 - h. Phase C: Yellow.
 - i. Neutral: Grey.
 - j. Ground: Green.
22. Factory-apply color the entire length of the conductors, except the following field-applied, color-coding methods may be used in lieu of factory-coded wire for sizes larger than No. 10 AWG.
- k. Colored, pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply the last 2 turns of tape with no tension to prevent possible unwinding. Use 1-inch-wide tape in colors as specified. Adjust tape bands to avoid obscuring cable identification markings.
- J. Apply identification to conductors as follows:
23. Multiple Power or Lighting Circuits in the Same Enclosure: Identify each conductor with source and circuit number. Use color coding for voltage and phase indication of secondary circuit.
2. Identify raceways and cables of certain systems with color banding as follows:
- l. Bands: Colored adhesive marking tape. Make each color band 2 inches wide, completely encircling conduit, and place adjacent bands of 2-color markings in contact, side by side.
 - m. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25 feet in congested areas.
 - n. Colors: As follows:
 - 1) Fire-Alarm System: Red.
 - 2) Security System: Blue and yellow.
 - 3) Telecommunications System: Green and yellow.
- K. Apply warning, caution, and instruction signs and stencils as follows:
24. Install warning, caution, and instruction signs where indicated or required to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved, plastic-laminated instruction signs with approved legend where instructions or explanations are needed for system or equipment operation. Install butyrate signs with metal backing for outdoor items.

L. Install identification as follows:

25. Apply equipment identification labels of engraved plastic laminate on each major unit of equipment, including central or master unit of each system. This includes communication, signal, and alarm systems, unless units are specified with their own self-explanatory identification. Except as otherwise indicated, provide a single line of text with 1/2-inch-high lettering on 1-1/2-inch-high label; where 2 lines of text are required, use lettering 2 inches high. Use white lettering on black field. Apply labels for each unit of the following categories of equipment.
 - o. Panelboards, electrical cabinets, and enclosures.
 - p. Access doors and panels for concealed electrical items.
 - q. Electrical switchgear and switchboards.
 - r. Motor control centers.
 - s. Motor starters.
 - t. Push-button stations.
 - u. Contactors.
 - v. Remote-controlled switches.
 - w. Dimmers.
 - x. Control devices.
 - y. Transformers.
 - z. Telephone switching equipment.
 - aa. Clock/program master equipment.
 - bb. Call system master station.
 - cc. TV/audio monitoring master station.
 - dd. Fire-alarm master station or control panel.
 - ee. Security-monitoring master station or control panel.
26. Apply designation labels of engraved plastic laminate for disconnect switches, breakers, push buttons, pilot lights, motor control centers, and similar items for power distribution and control components above, except panelboards and alarm/signal components where labeling is specified elsewhere. For panelboards, provide framed, typed circuit schedules with explicit description and identification of items controlled by each individual breaker.
27. For panelboards, provide framed, typed circuit schedules with explicit description including actual area room names and numbers that is agreeable to Architect and/or Owner and identification of items controlled by each individual breaker.

END OF SECTION 16195

SECTION 16420 - UTILITY COORDINATION

PART 1 - GENERAL

2.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

3.2 SUMMARY

- B. This Section specifies administrative and supervisory requirements necessary for Project coordination with all serving utilities companies providing power, telephone/data, and cable TV, including, but not necessarily limited to:
 - 1. Coordination.
 - 2. Administrative and supervisory personnel.
 - 3. General installation provisions.
- C. Include in the base contract price any and all utility company charges for service lines, utility relocations, and any other charges for service to this Project.
- D. Payment of power company charges are included in this contract. If power company charges are not available at time of bidding, state clearly in the bid that these charges are not included or the allowance provided.

4.3 COORDINATION

- E. Coordination: Coordinate construction activities included under various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections of the Specifications that are dependent upon each other for proper installation, connection, and operation.
 - 4. Where installation of one part of the Work is dependent on installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain the best results.
 - 5. Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.
 - 6. Make adequate provisions to accommodate items scheduled for later installation.
 - 7. Installer shall notify local operating company in writing of telephone interface connection requirements to ensure proper and timely interfacing of building telecommunication systems with the operating company's systems.
 - 8. Provide two (2) sets of construction drawing to each of the serving utilities area representatives within one (1) week of "Notice to Proceed".
 - 9. Information on the drawings is for general reference. Exact information and drawings for installation to be obtained directly from the utility company.

10. Coordinate with other electrical work including wires/cables, electrical boxes and fittings, and raceways, to properly interface installation of telephone system with other work.
11. Sequence installation of telephone system with other work to minimize possibility of damage and soiling during remainder of construction.

5.4 SUBMITTALS

- F. Coordination Drawings: Prepare and submit coordination Drawings where close and careful coordination is required for installation of products and materials fabricated off-site by separate entities, and where limited space availability necessitates maximum utilization of space for efficient installation of different components.
 12. Show the interrelationship of components shown on separate Shop Drawings.
 13. Indicate required installation sequences.
 14. Comply with requirements contained in Section "Submittals."
- G. Submit shop drawing of the Service Entrance Section and/or service equipment to the serving utility for their approval.

6.5 CODES AND STANDARDS:

- H. Electrical Code compliance: Comply with applicable local code requirements of the authority having jurisdiction and the NEC.
- I. Utilities Code and Standards: Comply with all applicable codes and standards of the serving utility.

PART 7 - PRODUCTS (Not Applicable).

PART 8 - EXECUTION

9.6 GENERAL INSTALLATION PROVISIONS

- J. Utility's Instructions: Comply with the utility's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.
- K. Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.
- L. Mounting Heights: Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decisions to the Architect for final decision.

3.2 HIGH VOLTAGE DISTRIBUTION (Above 600 volts)

- A. Each new building shall provide the necessary switches and transformers for its connected load.
- B. All High voltage wiring and equipment will meet Arizona Public Service (APS) requirements.
- C. High voltage switchgear shall be pad mounted, low profile, dead front type, tan finish as

manufactured by S&C Electric Company with Cooper Power Systems X-Limiter Full Range Current-limiting Fuses (15.5kV, amp size as required) on branch feeder sections and fault indicators located on the feeder sections.

- D. High voltage cable shall be #1/0 solid (branch feeder) or #750 kcmils (service feeder) AL 1-C 15 kV or 21kV .220 mills "TRXLPE" with concentric neutral, jacketed. LoadBreak Elbows Connectors 200A, 15kV.

Approved alternate: High voltage cable shall be #1/0 solid or #750 kcmils AL 1-C 15 kV .220 mills 133% insulation "XLPE" with concentric neutral, jacketed. LoadBreak Elbows Connectors 200A, 15kV. Written approval from University Construction & Planning must be received to use this alternate. (associated costs to be considered)

- E. Provide 15kV Metal Oxide Varistor Elbow Surge Arresters at each transformer.
- F. All terminations shall meet APS specs.

END OF SECTION 16420

SECTION 16425 - SWITCHBOARDS

PART 1 - GENERAL

2.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

3.2 SUMMARY

- B. This Section includes service and distribution switchboards rated 600 V and less.
- C. Related Sections include the following:
 - 1. Division 16 Section "Basic Electrical Materials and Methods" for general and installation materials and methods.
 - 2. Division 16 Section "Electrical Identification" for identification materials.
 - 3. Division 16 Section "Fuses."

4.3 SUBMITTALS

- D. Product Data: For each product and component specified.
- E. Shop Drawings: For each switchboard. Show dimensioned plans and elevations, including required clearances and service space, component and device lists, and a single-line diagram showing main- and branch-bus current ratings and short-time and short-circuit ratings of switchboard. Include the following:
 - 4. Descriptive documentation of optional barriers specified for electrical insulation and isolation.
 - 5. Utility company metering provisions with indication of approval by utility company.
 - 6. Details of spare-fuse cabinet showing material, dimensions, and features, including storage provisions for fuse cartons.
 - 7. Schedule of features, characteristics, ratings, and factory settings of individual protective devices.
 - 8. Wiring Diagrams: Details of wiring for power and control and differentiating between manufacturer-installed and field-installed wiring.
- F. Qualification Data: For firms and persons specified in "Quality Assurance" Article.
- G. Reports of Field Tests and Observations: Certified by testing agency.
- H. Manufacturer field service report.
- I. Certificates for field testing agency, signed by Contractor, certifying that agency complies with requirements specified in "Quality Assurance" Article below.

- J. Report of Field Tests and Observations: Certified by testing agency.
- K. Maintenance Data: For switchboards to include in the maintenance manuals specified in Division 1. Include detailed manufacturer's written instructions on adjusting overcurrent protective devices.

5.4 QUALITY ASSURANCE

- L. Testing Agency Qualifications: In addition to the requirements specified in Division 1 Section "Quality Control," an independent testing agency shall meet OSHA criteria for accreditation of testing laboratories, Title 29, Part 1907, or shall be a full-member company of the InterNational Electrical Testing Association.
 - 9. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or National Institute for Certification in Engineering Technologies, to supervise on-site testing specified in Part 3.
- M. Listing and Labeling: Provide switchboard assemblies specified in this Section that are listed and labeled.
 - 10. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
- N. Comply with NFPA 70.
- O. Product Selection for Restricted Space: Drawings indicate maximum dimensions for switchboard equipment, including clearances between switchboard and adjacent surfaces and items. Switchboards having equal performance characteristics and complying with indicated maximum dimensions may be considered.

6.5 DELIVERY, STORAGE, AND HANDLING

- P. Deliver in shipping splits of lengths that can be moved past obstructions in delivery path.
- Q. Store so condensation will not occur on or in switchboards. Provide temporary heaters as required to avoid condensation.
- R. Handle switchboards according to NEMA PB 2.1. Use only factory-installed lifting provisions.

7.6 PROJECT CONDITIONS

- S. Verify dimensions by field measurements.
- T. Determine suitable path for moving switchboard into place considering Project conditions.
- U. Verify clearance requirements. Locate switchboard to meet installation tolerances.
- V. Revise locations and elevations from those indicated as required to suit Project conditions.

8.7 EXTRA MATERIALS

- W. Spare Breakers: 6 spares of each type and rating of breakers devices used.

PART 9 - PRODUCTS

10.8 MANUFACTURERS

- X. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. General Electric Co.; Electrical Distribution and Control Division.

11.9 MANUFACTURED UNITS

- Y. Front-Connected, Front-Accessible Switchboard: Panel-mounted main device, panel-mounted branches, and sections rear aligned.
- Z. Front- and Rear-Accessible Switchboard: Front and rear aligned, with features as follows:
 - 11. Main Device: Individually fixed mounted.
 - 12. Branch Devices: Panel mounted.
 - 13. Branch Devices: Individually fixed mounted.
- AA. Ratings: Provide nominal system voltage, continuous main-bus amperage, and short-circuit current ratings as indicated.

12.10 FABRICATION AND FEATURES

- BB. Enclosure: Steel; NEMA 250
 - 14. Exterior locations or where noted, Type 3R rainproof.
 - 15. Interior locations: NEMA Type I.
- CC. Enclosure Finish for Outdoor Units: Factory-applied finish in manufacturer's standard color, including undersurfaces treated with corrosion-resistant undercoating.
- DD. Enclosure Finish for Indoor Units: Factory-applied finish in manufacture's standard gray finish over a rust-inhibiting primer on treated metal surface.
- EE. Barriers: Between adjacent switchboard sections.
- FF. Utility Metering Compartment: Fabricated compartment and section meeting utility company's requirements. If separate vertical section is required for utility metering, match and align with basic switchboard.
- GG. Bus Transition and Incoming Line Pull Sections: Matched and aligned with basic switchboard.
- HH. Hinged Front Panels: Allow access to breaker, metering, accessory, and blank compartments.
- II. Buses and Connections: 3 phase, 4 wire, except as otherwise indicated. Features as follows:
 - 16. Phase- and Neutral-Bus Material: Tin-plated, high-strength, electrical-grade aluminum alloy with copper or tin-plated, aluminum circuit-breaker line connections.
 - 17. Load Terminals: Silver-plated copper bus extensions equipped with pressure connectors for outgoing circuit conductors.

18. Ground Bus: 1/4-by-2-inch (6-by-50-mm) minimum size, drawn-temper copper of 98 percent conductivity; equipped with pressure connectors for feeder- and branch-circuit ground conductors.
19. Contact Surfaces of Buses: Silver plated.
20. Main Phase Buses, Neutral Buses, and Equipment Ground Buses: Uniform capacity the entire length of the switchboard main and distribution sections. Provide for future extensions from both ends.
21. Neutral Buses: 100 percent of the ampacity of the phase buses, except as indicated, and equipped with approved pressure connectors for outgoing circuit neutral cables. Bus extensions for busway feeder neutral bus is braced.

13.11 OVERCURRENT PROTECTIVE DEVICES

JJ. Enclosed, Molded-Case Circuit Breaker: NEMA AB 1, handle lockable.

22. Characteristics: Frame size, trip rating, number of poles, and auxiliary devices as indicated and interrupting capacity rating to meet available fault current.
23. Application Listing: Appropriate for application, including switching fluorescent lighting loads or heating, air-conditioning, and refrigerating equipment.
24. Circuit Breakers, 200 A and Larger: Trip units interchangeable within frame size.
25. Circuit Breakers, 400 A and Larger: Field-adjustable short-time and continuous current settings.
26. Lugs: Mechanical lugs and power-distribution connectors for number, size, and material of conductors indicated.
27. Shunt Trip: Where indicated.

KK. Enclosed, Insulated-Case Circuit Breaker: Fully rated, encased power circuit breaker.

28. Characteristics: Frame size, trip rating, number of poles, and auxiliary devices as indicated and interrupting capacity rating to meet available fault current.
29. Features: Include the following:
 - a. Microprocessor-based trip units with interchangeable rating plug and selectable I-squared-t response.
 - b. LED trip indicators.
30. Lugs: Mechanical lugs and power-distribution connectors for number, size, and material of conductors indicated.

LL. Future Devices: Where indicated, equip compartments with mounting brackets, supports, bus connections, and appurtenances designed for overcurrent protective device types and ampere ratings indicated.

14.12 OTHER CIRCUIT CONTROL AND PROTECTIVE DEVICES

- MM. Factory-installed and factory-tested devices of types listed below, with indicated ratings, settings, and features.
- NN. Transient Voltage Surge Suppressors: IEEE C62.41, selected to meet requirements for category indicated.
 - 31. Exposure: Low.
 - 32. Exposure: Medium.
 - 33. Exposure: High.
- OO. Impulse sparkover voltage coordinated with system circuit voltage.
- PP. Factory mounted with UL-recognized mounting device.

15.13 INSTRUMENTATION

- QQ. Multifunction Digital Metering Monitor: Microprocessor-based unit suitable for 3- or 4-wire systems and with the following features:
 - 34. Switch selectable digital display of the following values with maximum accuracy tolerances as indicated:
 - c. Phase Currents, Each Phase: Plus or minus 1 percent.
 - d. Phase-to-Phase Voltages, 3 Phase: Plus or minus 1 percent.
 - e. Phase-to-Neutral Voltages, 3 Phase: Plus or minus 1 percent.
 - f. Megawatts: Plus or minus 2 percent.
 - g. Megavars: Plus or minus 2 percent.
 - h. Power Factor: Plus or minus 2 percent.
 - i. Frequency: Plus or minus 0.5 percent.
 - j. Megawatt Demand: Plus or minus 2 percent; demand interval programmable from 5 to 60 minutes.
 - 35. Mounting: Display and control unit flush or semiflush mounted in instrument compartment door.

16.14 ACCESSORY COMPONENTS AND FEATURES

- RR. Portable Test Set: Arranged to permit testing of all functions of solid-state trip devices without removal from switchboard. Include relay and meter test plugs suitable for testing switchboard meters and switchboard class relays.
- SS. Spare-Fuse Cabinet: Suitably identified, wall-mounted, lockable, compartmented, steel box or cabinet. Arrange for wall mounting.

17.15 IDENTIFICATION

TT. Nameplates and label products are specified in Division 16 Section "Electrical Identification."

36. Compartment Nameplates: Engraved laminated-plastic or metal nameplate for each compartment, mounted with corrosion-resistant screws.

PART 18 - EXECUTION

19.16 EXAMINATION

UU. Examine elements and surfaces to receive switchboard for compliance with installation tolerances and other conditions affecting performance of switchboards.

37. Do not proceed with installation until unsatisfactory conditions have been corrected.

20.17 INSTALLATION

VV. Install switchboards level and plumb as indicated, according to manufacturer's written instructions and NEMA PB 2.1.

WW. Support switchboards on concrete housekeeping bases, 4-inch (100-mm) nominal thickness.

XX. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from switchboard units and components.

YY. Operating Instructions: Frame and mount printed, basic operating instructions for switchboards, including control and key interlocking sequences and emergency procedures and system one line. Fabricate frame of finished wood or metal and cover instructions with clear acrylic plastic. Mount on the front of switchboards.

21.18 CONNECTIONS

ZZ. Connect switchboards and components to wiring systems and to ground as indicated and instructed by manufacturer.

38. Tighten electrical connectors and terminals, including screws and bolts, according to manufacturer's published torque tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

22.19 IDENTIFICATION

AAA. Identify field-installed wiring and components and provide warning signs as specified in Division 16 Section "Electrical Identification."

BBB. Install compartment nameplates.

23.20 FIELD QUALITY CONTROL

CCC. Prepare for acceptance tests as follows:

- 39. Make insulation-resistance tests of each switchboard bus, component, and connecting supply, feeder, and control circuits.
- 40. Make continuity tests of each circuit.

DDD. Testing Agency: Provide the services of a qualified independent testing agency to perform specified acceptance testing.

EEE. Acceptance Testing: After installing switchboards and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

- 41. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Sections 7.1, 7.5 7.6, 7.9, 7.10, 7.11, and 7.14 as appropriate. Certify compliance with test parameters.

- 42. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units, and retest.

FFF. Infrared Scanning: After Substantial Completion, but not more than 2 months after Final Acceptance, perform an infrared scan of each switchboard. Remove fronts to make joints and connections accessible to a portable scanner.

- 43. Follow-up Infrared Scanning: Perform 1 additional follow-up infrared scan of each switchboard 11 months after date of Substantial Completion.

- 44. Instrument: Use an approved infrared scanning device designed to measure temperature or detect significant deviations from normal values. Provide calibration record for device used.

- 45. Record of Infrared Scanning: Prepare a certified report identifying switchboards checked and describing results of scanning. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

24.21 ADJUSTING

GGG. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

25.22 CLEANING

HHH. Upon completion of installation, inspect interior and exterior of switchboards. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish.

END OF SECTION 16425

SECTION 16452

GROUNDING

PART 1 - GENERAL

2.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

3.2 SUMMARY

- B. This Section includes grounding of electrical systems and equipment and basic requirements for grounding for protection of life, equipment, circuits, and systems. Grounding requirements specified in this Section may be supplemented in other Sections of these Specifications.
- C. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 2 Section "Chain Link Fences and Gates" for fence and gate grounding requirements.
 - 2. Division 10 Section "Flagpoles" for grounding of flagpoles.
 - 3. Division 13 Section "X-Ray Protection" for bonding and grounding of system components.
 - 4. Division 16 Section "Underground Ducts and Utility Structures" for manhole bonding and grounding requirements.
 - 5. Division 16 Section "Wires and Cables" for requirements for grounding conductors.

4.3 SUBMITTALS

- D. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

5.4 QUALITY ASSURANCE

- E. Comply with NFPA 70.
- F. Comply with UL 467.
- G. Listing and Labeling: Provide products specified in this Section that are listed and labeled.
- 6. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.

PART 6 - PRODUCTS

7.5 MANUFACTURERS

- H. Manufacturers: Subject to compliance with requirements.

8.6 GROUNDING AND BONDING PRODUCTS

- I. Governing Requirements: Where types, sizes, ratings, and quantities indicated are in excess of National Electrical Code (NEC) requirements, the more stringent requirements and the greater size, rating, and quantity indications govern.

9.7 WIRE AND CABLE GROUNDING CONDUCTORS

- J. Comply with Division 16 Section "Wires and Cables." Conform to NEC Table 8, except as otherwise indicated, for conductor properties, including stranding.
 - 7. Material: Copper. Use only copper wire for both insulated and bare grounding conductors.
- K. Equipment Grounding Conductors: Insulated with green color insulation.
- L. Grounding-Electrode Conductors: Stranded cable.
- M. Underground Conductors: Bare, tinned, stranded, except as otherwise indicated.
- N. Bare Copper Conductors: Conform to the following:
 - 8. Solid Conductors: ASTM B 3.
 - 9. Assembly of Stranded Conductors: ASTM B 8.
 - 10. Tinned Conductors: ASTM B 33.

10.8 MISCELLANEOUS CONDUCTORS

- O. Grounding Bus: Bare, annealed-copper bars of rectangular cross section.
- P. Braided Bonding Jumpers: Copper tape, braided No. 30 AWG bare copper wire, terminated with copper ferrules.
- Q. Bonding Straps: Soft copper, 0.05 inch thick and 2 inches wide, except as indicated.

11.9 CONNECTOR PRODUCTS

- R. Pressure Connectors: High-conductivity-plated units.
- S. Bolted Clamps: Heavy-duty type.
- T. Exothermic-Welded Connections: Provided in kit form and selected per manufacturer's written instructions for specific types, sizes, and combinations of conductors and connected items.

12.10 GROUNDING ELECTRODES

- U. Grounding Rods: Copper-clad steel.
 - 11. Size: 3/4 inch by 120 inches.
- V. Plate Electrodes: Copper, square or rectangular shape. Minimum 0.10 inch thick, size as indicated.

PART 13 - EXECUTION

14.11 APPLICATION

- W. Equipment Grounding Conductors: Comply with NEC Article 250 for types, sizes, and quantities of equipment grounding conductors, except where specific types, larger sizes, or more conductors than required by NEC are indicated.
 - 12. Install equipment grounding conductor with circuit conductors.
 - 13. Busway Supply Circuits: Install separate equipment grounding conductor from the grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding-bar terminal on busway.
 - 14. Computer Outlet and Isolated Grounding-Receptacle Circuits: Install an additional separate insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate grounding conductor from raceway and from panelboard grounding terminals. Terminate at the equipment grounding-conductor terminal of the applicable derived system or service, except as otherwise indicated.
 - 15. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.
- X. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide a No. 4 AWG minimum insulated grounding conductor in raceway from grounding-electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
 - 16. Service and Central Equipment Locations, Terminal Cabinets and Wiring Closets: Terminate grounding conductor on a grounding terminal.
- Y. Separately Derived Systems: Where NEC requires grounding, ground according to NEC Paragraph 250-26.
- Z. Metal Poles Supporting Outdoor Lighting Fixtures: Ground pole to a grounding electrode in addition to separate equipment grounding conductor run with supply branch circuit.
- AA. Connections to Lightning Protection System: Bond grounding conductors, including grounding-conductor conduits, to lightning protection down conductors or lightning protection grounding conductors in compliance with NFPA 780.

15.12 INSTALLATION

- BB. General: Ground electrical systems and equipment according to NEC requirements, except where Drawings or Specifications exceed NEC requirements.
- CC. Grounding Rods: Locate a minimum of 1-rod length from each other and at least the same distance from any other grounding electrode.
 - 17. Drive until tops are 2 inches below finished floor or final grade, except as otherwise indicated.
 - 18. Interconnect with grounding-electrode conductors. Use exothermic welds, except as otherwise indicated. Make these connections without damaging copper coating or exposing steel.

- DD. Grounding Conductors: Route along the shortest and straightest paths possible, except as otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- EE. Underground Grounding Conductors: Use bare copper wire. Bury at least 24 inches below grade.
- FF. Bond interior metal piping systems and metal air ducts to equipment grounding conductors of associated pumps, fans, blowers, electric heaters, and air cleaners. Use braided-type bonding straps.
- GG. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NEC Paragraph 250-81(c), using a minimum of 20 feet of bare copper conductor not smaller than No. 4 AWG. Where base of concrete foundation is less than 20 feet in length, coil excess conductor within base of concrete foundation. Bond grounding conductor to reinforcing steel to at least 4 locations, and to anchor bolts. Extend grounding conductor below grade and connect to building grounding grid or to a grounding electrode external to concrete.

16.13 CONNECTIONS

- HH. General: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
 - 19. Use electroplated or hot-tin-coated materials to assure high conductivity and to make contact points closer in order of galvanic series.
 - 20. Make connections with clean, bare metal at points of contact.
 - 21. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
- II. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections, except those at test wells. Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
- JJ. Equipment Grounding-Wire Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
- KK. Noncontact Metal Raceway Terminations: Where metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at both entrances and exits with grounding bushings and bare grounding conductors, except as otherwise indicated.
- LL. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. Where these requirements are not available, use those specified in UL 486A and UL 486B.
- MM. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by manufacturer of connectors. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.
- NN. Moisture Protection: Where insulated grounding conductors are connected to grounding rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

END OF SECTION 16452

SECTION 16460 - TRANSFORMERS

PART 1 - GENERAL

2.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

3.2 SUMMARY

- B. This Section includes general-purpose and specialty dry-type transformers and voltage regulators with windings rated 600 V or less.

4.3 SUBMITTALS

- C. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.
- D. Product data for each product specified, including dimensioned plans, sections, and elevations. Show minimum clearances and installed features and devices.
- E. Wiring diagrams of products differentiating between manufacturer-installed and field-installed wiring.
- F. Operation and maintenance data for materials and products to include in the "Operating and Maintenance Manual" specified in Division 1.
- G. Field test reports of tests and inspections conducted according to Part 3 of this Section.

5.4 QUALITY ASSURANCE

- H. Comply with NFPA 70 "National Electrical Code."
- I. Comply with IEEE C2 "National Electrical Safety Code."
- J. Listing and Labeling: Products are listed and labeled.
 - 1. The Terms "Listed" and "Labeled": As defined in the "National Electrical Code," Article 100.

PART 6 - PRODUCTS

7.5 MANUFACTURERS

- K. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 2. Transformers:

- a. Acme Electric Corp.
- b. Challenger Electrical Equipment Co.
- c. General Electric Co.
- d. Hevi-Duty Electric.
- e. Matra Electric, Inc.
- f. ROMAC Supply Co.
- g. Square D Co.
- h. R.E. Uptegraff Mfg. Co.
- i. Westinghouse Electric Corp.

8.6 TRANSFORMERS, GENERAL

- L. Transformers: Factory-assembled and -tested, air-cooled units of types specified, designed for 60-Hz service.
- M. Cores: Grain-oriented, nonaging silicon steel.
- N. Coils: Continuous windings without splices except for taps.
- O. Internal Coil Connections: Brazed or pressure type.

9.7 GENERAL-PURPOSE, DRY-TYPE TRANSFORMERS

- P. Comply with NEMA Standard ST 20 "Dry-Type Transformers for General Applications."
- Q. Transformers: Two-winding type, 3-phase units using 1 coil per phase in primary and secondary.
- R. Low Sound Level Units: Where indicated, minimum of 3 dBA less than NEMA ST 20 standard sound levels when factory tested according to IEEE Standard C57.12.91, "Test Code for Dry-Type Distribution and Power Transformers."
- S. Features and Ratings: As follows:
 - 3. Enclosure: Indoor, ventilated.
 - 4. Enclosure: Exterior; totally enclosed, nonventilated, suitable for outdoor use.
- T. Insulation Class: 185 deg C or 220 deg C class for transformers 15 kVA or smaller; 220 deg C class for transformers larger than 15 kVA.
 - 5. Insulation Temperature Rise: 150 deg C maximum rise above 40 deg C, for 220 deg C class insulation; 115 deg C maximum rise for 185 deg C class insulation.
- U. Taps: For transformers 3 KVA and larger, full capacity taps in high-voltage winding shall be six (6) 2.5 percent taps, 2 above and 4 below, rated high voltage.
- V. Accessories: The following accessory items are required where indicated:

6. Surge Arresters: NEMA Standard LA 1, low-voltage type, factory installed and connected to low-voltage terminals.
7. Electrostatic Shielding: Where indicated; insulated metallic shield between primary and secondary windings.
 - j. Connect shield to terminal marked "Shield" for grounding connection.
 - k. Capacitance: Arrange shield to provide a maximum of 33 picofarads primary-to-secondary capacitance over a frequency range of 20 Hz to 1 MHz.
8. Wall-Mounting Brackets: Manufacturer's standard brackets for transformers up to 75 kVA.

10.8BUCK-BOOST TRANSFORMERS

- W. Comply with NEMA Standard ST 1, "Specialty Transformers," and UL Standard 506, "Specialty Transformers."
- X. Capacity Rating: Continuous duty.
- Y. Type: Self-cooled, dry type, connected as autotransformers to provide the percentage of buck or boost indicated.
- Z. Enclosure: Suitable for the location where installed.

11.9CONTROL AND SIGNAL TRANSFORMERS

- AA. Comply with NEMA Standard ST 1, "Specialty Transformers," and UL Standard 506, "Specialty Transformers."
- BB. Ratings: Continuous duty. Where ratings is not indicated, provide capacity exceeding peak load by 50 percent minimum.
- CC. Type: Self-cooled, 2-winding, dry type.
- DD. Enclosure: Suitable for the location where installed.

12.10 SOURCE QUALITY CONTROL

- EE. Factory Tests: Design and routine tests conform to referenced standards.

2.7 – SERVICE TRANSFORMERS

- A. Service transformers shall be three phase pad mounted, dead front loop feed, oil filled (non-PCB), air cooled, 95kV BIL, Bay-o-net current-limiting oil immersed fusing as manufactured by Cooper or equal. Transformer shall be locate at exterior service side of building for accessibility.
- B. Captive Pentahead bolt shall be used on transformer door (Penta head socket to be turned over to FMD when job is complete).
- C. Transformers shall not be located in basements or other areas subject to contaminant by floodwaters.

PART 13 - EXECUTION

14.11 INSTALLATION

- FF. Arrange equipment to provide adequate spacing for access and for cooling air circulation.
- GG. Identify transformers and install warning signs according to Division 16 Section "Basic Electrical Materials and Methods".
- HH. Loosen internal mounting bolts for proper functioning of vibration isolation.
- II. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not furnished, use those specified in UL 486A and UL 486B.
- JJ. Install transformer on isolation pads. Size and type as recommended by manufacturer, where noted on plans.

15.12 GROUNDING

- KK. Ground transformers and systems served by transformers according to Division 16 Section "Grounding."

16.13 FIELD QUALITY CONTROL

- LL. Test Objectives: To ensure transformer installation is operational within industry and manufacturer's tolerances, install according to Contract Documents, and suitable for energizing.
- MM. Tests: Include the following minimum inspections and tests according to the manufacturer's instructions. Conform to IEEE Standard Test Code C57.12.91 for dry-type units, test method, and data correction factors.
 - 9. Inspect accessible components for cleanliness, mechanical, and electrical integrity, for presence of damage or deterioration, and to ensure removal of temporary shipping bracing. Do not proceed with tests until deficiencies are corrected.
 - l. Include internal inspection through access panels and covers.
 - m. Inspect bolted electrical connections for tightness according to manufacturer's published torque values or, where not available, those of UL standards 486A and 486B.
 - 10. Insulation Resistance: Perform megohmmeter test of primary and secondary winding-to-winding and winding-to-ground. Use a minimum test voltage of 1,000 V d.c. Minimum insulation resistance is 500 megohms.
 - 11. Duration of Each Test: 10 minutes.
 - 12. Temperature Correction: Correct results for test temperature deviation from 20° C standard.
- NN. Test Failures: Correct deficiencies identified by tests and retest. Verify that equipment meets the specified requirements.

17.14 ADJUSTING

- 00. After completing installation, cleaning, and testing, touch up scratches and mars on finish to match original finish.
- PP. Adjust transformer taps to provide optimum voltage conditions at utilization equipment throughout the normal operating cycle of the facility. Record voltages and tap settings to submit with test results.
- QQ. Adjust buck-boost transformer connections to provide optimum voltage conditions at utilization equipment throughout the normal operating cycle of the facility.

END OF SECTION 16460

SECTION 16470

PANELBOARDS

PART 1 - GENERAL

2.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

3.2 SUMMARY

- B. This Section includes lighting and power panelboards and associated auxiliary equipment rated 600 V and less.
- C. Related Sections include the following:
 - 1. Division 16 Section "Basic Electrical Materials and Methods" for general materials and installation methods.
 - 2. Division 16 Section "Electrical Identification" for labeling materials.
 - 3. Division 16 Section "Fuses."

4.3 SUBMITTALS

- D. Product Data: For each type of panelboard, accessory item, and component specified.
- E. Shop Drawings: For panelboards. Include dimensioned plans, sections, and elevations. Show tabulations of installed devices, major features, and voltage rating. Include the following:
 - 4. Enclosure type with details for types other than NEMA 250, Type 1.
 - 5. Bus configuration and current ratings.
 - 6. Short-circuit current rating of panelboard.
 - 7. Features, characteristics, ratings, and factory settings of individual protective devices and auxiliary components.
 - 8. Wiring Diagrams: Details of schematic diagram including control wiring and differentiating between manufacturer-installed and field-installed wiring.
- F. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.
- G. Maintenance Data: For panelboard components to include in the maintenance manuals specified in Division 1. Include manufacturer's written instructions for testing circuit breakers.

5.4 QUALITY ASSURANCE

- H. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

- 9. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
- I. Comply with NFPA 70.
- J. Comply with NEMA PB 1.

PART 6 - PRODUCTS

7.5 MANUFACTURERS

- K. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 10. Eaton Corp.; Westinghouse & Cutler-Hammer Products.
 - 11. General Electric Co.; Electrical Distribution & Control Div.
 - 3. Square D Co.
 - 4. Siemens.

8.6 PANELBOARD FABRICATION

- L. Enclosures: Flush- or surface-mounted cabinets as indicated. NEMA PB 1, Type 1, unless otherwise indicated to meet environmental conditions at installed location.
 - 12. Outdoor Locations: NEMA 250, Type 3R.
 - 13. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
- M. Directory Frame: Metal, mounted inside each panelboard door.
- N. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors. Bonded to box.
- O. Service Equipment Approval: Listed for use as service equipment for panelboards with main service disconnect.
- P. Future Devices: Equip with mounting brackets, bus connections, and necessary appurtenances, for the overcurrent protective device ampere ratings indicated for future installation of devices.
- Q. Special Features: Include the following features for panelboards:
 - 14. Isolated Equipment Ground Bus Where Indicated: Adequate for branch-circuit equipment ground conductors; insulated from box.
 - 15. Hinged Front Cover: Entire front trim hinged to box with standard door within hinged trim cover.
- R. Extra Gutter Space: Dimensions and arrangement as indicated.
 - 16. Subfeed: Overcurrent protective device or lug provision as indicated.
- S. Feed-through Lugs: Sized to accommodate feeders indicated.

9.7 LOAD CENTERS

- T. Load center type panelboards are not permitted.

10.8 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- U. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- V. Doors: In panelboard front, with concealed hinges. Secure with flush catch and tumbler lock, all keyed alike.

11.9 DISTRIBUTION PANELBOARDS

- W. Doors: In panelboard front, except omit in fusible-switch panelboard, unless otherwise indicated. Secure door with vault-type latch with tumbler lock, all keyed alike.
- X. Branch-Circuit Breakers: Where overcurrent protective devices are indicated to be circuit breakers, use bolt-on circuit breakers, except circuit breakers 225-A frame size and greater may be plug-in type where individual positive-locking device requires mechanical release for removal.

12.10 OVERCURRENT PROTECTIVE DEVICES

- Y. Molded-Case Circuit Breaker: NEMA AB 1, handle lockable.
 - 17. Characteristics: Frame size, trip rating, number of poles, and auxiliary devices as indicated and interrupting capacity rating to meet available fault current.
 - 18. Application Listing: Appropriate for application, including Type SWD for switching fluorescent lighting loads and Type HACR for heating, air-conditioning, and refrigerating equipment.
 - 19. Circuit Breakers, 200 A and Larger: Trip units interchangeable within frame size.
 - 20. Circuit Breakers, 400 A and Larger: Field-adjustable short-time and continuous current settings.
 - 21. Lugs: Mechanical lugs and power-distribution connectors for number, size, and material of conductors indicated.
 - 22. Shunt Trip: Where indicated.
- Z. Fusible Switch: NEMA KS 1, Type HD, clips to accommodate specified fuses, handle lockable.

13.11 TRANSIENT VOLTAGE SURGE SUPPRESSORS

- AA. Description: IEEE C62.41, selected to meet requirements for category indicated.
 - 1. Exposure: Medium.
- BB. Impulse sparkover voltage coordinated with system circuit voltage.
- CC. Factory mounted with UL-recognized mounting device.

PART 14 - EXECUTION

15.12 INSTALLATION

- DD. Install panelboards and accessory items according to NEMA PB 1.1
- EE. Mounting Heights: Top of trim 74 inches above finished floor, unless otherwise indicated.
- FF. Mounting: Plumb and rigid without distortion of box. Mount flush panelboards uniformly flush with wall finish.
- GG. Circuit Directory: Type directory to indicate installed circuit loads after balancing panelboard loads. Obtain approval before installing.
- HH. Install filler plates in unused spaces.
- II. Provision for Future Circuits at Flush Panelboards: Stub four 1-inch (27-GRC) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future.
- JJ. Wiring in Panelboard Gutters: Arrange conductors into groups, and bundle and wrap with wire ties after completing load balancing.

16.13 IDENTIFICATION

- KK. Identify field-installed wiring and components and provide warning signs as specified in Division 16 Section "Electrical Identification."
- LL. Panelboard Nameplates: Label each panelboard with engraved laminated-plastic or metal nameplates mounted with corrosion-resistant screws.

17.14 GROUNDING

- MM. Make equipment grounding connections for panelboards as indicated.
- NN. Provide ground continuity to main electrical ground bus as indicated.

18.15 CONNECTIONS

- OO. Tighten electrical connectors and terminals, including grounding connections, according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

19.16 FIELD QUALITY CONTROL

- PP. Prepare for acceptance tests as follows:
 - 23. Make insulation-resistance tests of each panelboard bus, component, and connecting supply, feeder, and control circuits.
 - 24. Make continuity tests of each circuit.
- QQ. Testing: After installing panelboards and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
 - 25. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.

26. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units, and retest.

20.17 ADJUSTING

- RR. Set field-adjustable switches and circuit-breaker trip ranges as directed.

21.18 CLEANING

- SS. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish.

END OF SECTION 16470

SECTION 16475

FUSES

PART 1 - GENERAL

2.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

3.2 SUMMARY

- B. This Section includes the following:

- 1. Fuses.

4.3 SUBMITTALS

- C. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- D. Product Data for each fuse type specified.
- E. Product Data for each fuse type specified. Include the following:
 - 2. Descriptive data and time-current curves.
 - 3. Let-through current curves for fuses with current-limiting characteristics.
 - 4. Coordination charts and tables and related data.
 - 5. Fuse size for elevator feeder and disconnect applications.

5.4 QUALITY ASSURANCE

- F. Source Limitations: Obtain fuses from one source and by a single manufacturer.
- G. Comply with NFPA 70 for components and installation.
- H. Listing and Labeling: Provide fuses specified in this Section that are listed and labeled.
 - 6. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.

PART 6 - PRODUCTS

7.5 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide fuses by one of the following:
 - 7. Cooper Industries, Inc.; Bussmann Div.
 - 8. Gould Shawmut.

9. Tracor, Inc.; Littelfuse, Inc. Subsidiary.

8.6 CARTRIDGE FUSES

- A. Characteristics: NEMA FU 1, nonrenewable cartridge fuse; class as specified or indicated; current rating as indicated; voltage rating consistent with circuit voltage.

PART 9 - EXECUTION

10.7 EXAMINATION

- A. Examine utilization equipment nameplates and installation instructions to verify proper fuse locations, sizes, and characteristics.
- B. Do not proceed with installation until unsatisfactory conditions have been corrected.

11.8 FUSE APPLICATIONS

- I. Provide type as shown on the drawings and size as required by utilization equipment.
- B. Provide 18"X18"X8" Enclosure mounted by the electrical service with three (3) spare fuses for each main electrical equipment.

12.9 INSTALLATION

- J. Install fuses in fusible devices as indicated. Arrange fuses so fuse ratings are readable without removing fuse.
- K. Verify ratings and class to suit actual motor and equipment served.

13.10 IDENTIFICATION

- L. Install typewritten labels on inside door of each fused switch to indicate fuse replacement information.

END OF SECTION 16475

SECTION 16476

DISCONNECT SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

2.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

3.2 SUMMARY

- B. This Section includes individually and group mounted switches and circuit breakers used for the following:
 - 1. Service Entrance section and switchboards.
 - 2. Panelboards.
 - 3. Feeder and equipment disconnect.
 - 4. Feeder branch-circuit protection.
 - 5. Motor disconnect.
- C. Related Sections: The following Sections contain requirements that relate to this Section:
 - 6. Division 16 Section "Wiring Devices" for attachment plugs and receptacles, and snap switches used for disconnect switches.
 - 7. Division 16 Section "Switchboards" for individually enclosed, fused power-circuit devices used as feeder disconnect switches.
 - 8. Division 16 Section "Fuses" for fuses in fusible disconnect switches.

4.3 SUBMITTALS

- D. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- E. Product Data for switches, circuit breakers, and accessories specified in this Section. Include the following:
 - 9. Descriptive data and time-current curves.
 - 10. Let-through current curves for circuit breakers with current-limiting characteristics.
 - 11. Coordination charts and tables and related data.
- F. Wiring diagrams detailing wiring for power and control systems and differentiating between manufacturer-installed and field-installed wiring.
- G. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project

names and addresses, names and addresses of architects and owners, and other information specified.

- H. Field test reports indicating and interpreting test results.
- I. Maintenance data for tripping devices to include in the operation and maintenance manual specified in Division 1.

5.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain disconnect switches and circuit breakers from one source and by a single manufacturer.
- B. Comply with NFPA 70 for components and installation.
- C. Listing and Labeling: Provide disconnect switches and circuit breakers specified in this Section that are listed and labeled.

12. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.

PART 6 - PRODUCTS

7.5 MANUFACTURERS

- J. Manufacturers: Subject to compliance with requirements, provide disconnect switches and circuit breakers by one of the following:

13. Fusible Switches:

- a. Eaton Corp.; Cutler-Hammer Products.
- b. General Electric Co.; Electrical Distribution and Control Division.
- c. Siemens Energy & Automation, Inc.
- d. Square D Co.

14. Molded-Case Circuit Breakers:

- e. Eaton Corp.; Cutler-Hammer Products.
- f. General Electric Co.; Electrical Distribution and Control Division.
- g. Siemens Energy & Automation, Inc.
- h. Square D Co.

15. Combination Circuit Breaker and Ground Fault Trip:

- i. General Electric Co.; Electrical Distribution and Control Division.
- j. Siemens Energy & Automation, Inc.
- k. Square D Co.
- l. Westinghouse Electric Corp.; Distribution & Control Business Unit.

8.6 DISCONNECT SWITCHES

- K. Enclosed, Nonfusible Switch: NEMA KS 1, Type HD, with lockable handle.
- L. Enclosed, Fusible Switch, 800 A and Smaller: NEMA KS 1, Type HD, clips to accommodate specified fuses, enclosure consistent with environment where located, handle lockable with 2 padlocks, and interlocked with cover in CLOSED position.
- M. Enclosure: NEMA KS 1, Type 1, unless otherwise specified or required to meet environmental conditions of installed location.

16. Outdoor Locations: Type 3R.

9.7 CIRCUIT BREAKERS

- N. Molded-Case Circuit Breaker: NEMA AB 1, with lockable handle.
- O. Characteristics: Frame size, trip rating, number of poles, and auxiliary devices as indicated and interrupting rating to meet available fault current.
- P. Application Listing: Appropriate for application, including switching fluorescent lighting loads or heating, air-conditioning, and refrigerating equipment.
- Q. Circuit Breakers, 200 A and Larger: Trip units interchangeable within frame size.
- R. Circuit Breakers, 400 A and Larger: Field-adjustable, short-time and continuous-current settings.
- F. Molded-Case Switch: Where indicated, molded-case circuit breaker without trip units.
- G. Lugs: Mechanical lugs and power-distribution connectors for number, size, and material of conductors indicated.
- H. Shunt Trip: Where indicated.
- I. Accessories: As indicated.
- J. Enclosure: NEMA AB 1, Type 1, unless otherwise specified or required to meet environmental conditions of installed location.

17. Outdoor Locations: Type 3R.

PART 10 - EXECUTION

11.8 INSTALLATION

- S. Install disconnect switches and circuit breakers in locations as indicated, according to manufacturer's written instructions.
- T. Install disconnect switches and circuit breakers level and plumb.
- U. Install wiring between disconnect switches, circuit breakers, control, and indication devices.
- V. Connect disconnect switches and circuit breakers and components to wiring system and to ground as indicated and instructed by manufacturer.

18. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

W. Verify rating and settings to suit actual motor or equipment served.

- X. Identify each disconnect switch and circuit breaker according to requirements specified in Division 16 Section "Electrical Identification."

12.9 FIELD QUALITY CONTROL

- A. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

13.10 ADJUSTING

- Y. Set field-adjustable disconnect switches and circuit-breaker trip ranges as indicated.

14.11 CLEANING

- Z. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish including chips, scratches, and abrasions.

END OF SECTION 16476

SECTION 16515
INTERIOR LIGHTING

PART 1 - GENERAL

2.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

3.2 SUMMARY

- B. This Section includes interior lighting fixtures, lamps, ballasts, emergency lighting units, and accessories.
- C. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 16 Section "Exterior Lighting" for exterior security lighting, roadway and parking lot lighting, poles, and standards.
 - 2. Division 16 Section "Lighting Control Equipment" for modular dimmers, programmable lighting control systems, time switches, photoelectric relays, occupancy sensors, power relays, and contactors.

4.3 DEFINITIONS

- D. Emergency Lighting Unit: A fixture with integral emergency battery-powered supply and the means for controlling and charging the battery. It is also known as an emergency light set.
- E. Fixture: A complete lighting unit, exit sign, or emergency lighting unit. Fixtures include lamps and parts required to distribute light, position and protect lamps, and connect lamps to power supply. Internal battery-powered exit signs and emergency lighting units also include a battery and the means for controlling and recharging the battery. Emergency lighting units include ones with and without integral lamp heads.
- F. Average Life: The time after which 50 percent fails and 50 percent survives under normal conditions.

5.4 SUBMITTALS

- G. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- H. Product Data describing fixtures, lamps, ballasts, and emergency lighting units. Arrange Product Data for fixtures in order of fixture designation. Include data on features and accessories and the following:
 - 3. Outline drawings indicating dimensions and principal features of fixtures.
 - 4. Electrical Ratings and Photometric Data: Certified results of independent laboratory tests for fixtures and lamps.
 - 5. Battery and charger data for emergency lighting units.

- I. Maintenance data for fixtures to include in the operation and maintenance manual specified in Division 1.

6.5 QUALITY ASSURANCE

- J. Electrical Component Standard: Provide components that comply with NFPA 70 and that are listed and labeled by UL where available.
- K. Listing and Labeling: Provide fixtures, emergency lighting units, and accessory components specified in this Section that are listed and labeled for their indicated use and installation conditions on Project.
 - 6. Special Listing and Labeling: Provide fixtures for use in damp or wet locations and recessed in combustible construction that are specifically listed and labeled for such use. Provide fixtures for use in hazardous (classified) locations that are listed and labeled for the specific hazard.
 - 7. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
- L. Coordinate fixtures, mounting hardware, and trim with ceiling system and other items, including work of other trades, required to be mounted on ceiling or in ceiling space.

7.6 WARRANTY

- M. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- N. Special Warranty for Batteries: Submit a written warranty executed by the manufacturer agreeing to replace rechargeable system batteries on a prorated basis that fail in materials or workmanship within the specified warranty period.

PART 8 - PRODUCTS

9.7 MANUFACTURERS

- O. Products: Subject to compliance with requirements, provide one of the products specified in the Lighting Fixture Schedule on the plans.
- P. Lamps:
 - 8. General Electric
 - 9. Osram Sylvania
 - 10. Phillips Lightings
- Q. Ballast:
 - 11. Advance
 - 2. Sylvania
 - 3. General Electric

10.8 FIXTURES AND FIXTURE COMPONENTS, GENERAL

- R. Metal Parts: Free from burrs, sharp corners, and edges.
- S. Sheet Metal Components: Steel, except as indicated. Form and support to prevent warping and sagging.
- T. Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit relamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during relamping and when secured in operating position.
- U. Reflecting Surfaces: Minimum reflectance as follows, except as otherwise indicated:
 - 12. White Surfaces: 85 percent.
 - 13. Specular Surfaces: 83 percent.
 - 14. Diffusing Specular Surfaces: 75 percent.
 - 15. Laminated Silver Metallized Film: 90 percent.
- V. Lenses, Diffusers, Covers, and Globes: 100 percent virgin acrylic plastic or water white, annealed crystal glass, except as otherwise indicated.
 - 16. Plastic: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 - 17. Lens Thickness: 0.125 inch minimum; except where greater thickness is indicated.
- W. Fixture Support Components: Comply with Division 16 Section "Basic Electrical Materials and Methods."

18. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fitting and ceiling canopy. Finish same as fixture.
 19. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy arranged to mount a single fixture. Finish same as fixture.
 20. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
 21. Hook Hanger: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.
- X. Fluorescent Fixtures: Conform to UL 1570.
- Y. Fluorescent Ballasts: Electronic integrated circuit, solid-state, full-light-output, energy-efficient type compatible with lamps and lamp combinations to which connected.
22. Certification by Electrical Testing Laboratory (ETL).
 23. Type: Class P, high power factor, except as otherwise indicated.
 24. Sound Rating: "A" rating, except as otherwise indicated.
 25. Voltage: Match connected circuits.
 26. Lamp Flicker: Less than 5 percent.
 27. Minimum Power Factor: 98 percent.
 28. Total Harmonic Distortion (THD) of Ballast Current: Less than 20 percent.
 29. Conform to FCC Regulations Part 15, Subpart J for electromagnetic interference.
 30. Conform to IEEE C62.41, Category A, for resistance to voltage surges for normal and common modes.
 31. Multilamp Ballasts: Use 2, 3, or 4 lamp ballasts for multilamp fixtures where possible.
 32. Lamp-ballast connection method does not reduce normal rated life of lamps.
 33. Low-Temperature Fluorescent Ballasts: Comply with above requirements, except ballast may be Class P electromagnetic type. Starting temperature is minus 20 deg C or colder.
 34. Dimming Ballasts: Electronic type providing smooth dimming over a minimum range from 100 to 5 percent light output. Listed for use with specific fluorescent dimming system provided. Dimming systems are specified in Division 16 Section "Lighting Control Equipment." Fluorescent wall dimmers are specified in Division 16 Section "Wiring Devices."
- Z. High-Intensity-Discharge (HID) Fixtures: Conform to UL 1572.
- J. HID Ballasts: Conform to UL 1029 and ANSI C82.4. Include the following features, except as otherwise indicated.
35. Constant wattage autotransformer (CWA) or regulating high-power-factor type, unless otherwise indicated.
 36. Operating Voltage: Match system voltage.
 37. Single-Lamp Ballasts: Minimum starting temperature of minus 30 deg C.38. Normal Ambient Operating Temperature: 40 deg C.

- 39. Open circuit operation will not reduce average life.
- 40. High-Pressure Sodium (HPS) Ballasts: Equip with a solid-state igniter/starter having an average life in pulsing mode of 10,000 hours at an igniter/starter case temperature of 90 deg C.
- K. Instant Restrike Device: Solid-state, potted module, mounted inside HPS fixture and compatible with HPS lamps, ballasts, and sockets up to 150 W.
 - 41. Restrike Range: 105 to 130 VAC.
 - 42. Maximum Voltage: 250 V peak or 150 VAC RMS.
- L. Incandescent Fixtures: Conform to UL 1571.
- M. Track-Lighting Systems: Conform to UL 1574. Provide components, including track, fittings, and fixtures, from same manufacturer and as recommended by manufacturer for intended use.
- N. Exit Signs: Conform to UL 924 and the following:
 - 43. Sign Colors: Conform to local code.
 - 44. Minimum Height of Letters: Conform to local code.
 - 45. Arrows: Include as indicated.
 - 46. Lamps for AC Operation: Light-emitting diodes (LED), 70,000 hours minimum rated life.

11.9 LAMPS

- AA. Comply with ANSI C78 series that is applicable to each type of lamp.
- BB. Fluorescent Color Temperature and Minimum Color-Rendering Index (CRI): 4100 K and 85 CRI, except as otherwise indicated.
- C. Noncompact Fluorescent Lamp Life: Rated average is 20,000 hours at 3 hours per start when used on rapid start circuits.
- D. Metal Halide Color Temperature and Minimum Color-Rendering Index (CRI): 3600 K and 70 CRI, except as otherwise indicated.

12.10 FINISHES

- CC. Manufacturer's standard, except as otherwise indicated, applied over corrosion-resistant treatment or primer, free of streaks, runs, holidays, stains, blisters, and similar defects.

PART 13 - EXECUTION

14.11 INSTALLATION

- DD. Set units plumb, square, and level with ceiling and walls, and secure according to manufacturer's written instructions and approved Shop Drawings. Support fixtures according to requirements of Division 16 Section "Basic Electrical Materials and Methods."
- EE. Support for Recessed and Semirecessed Grid-Type Fluorescent Fixtures: Units attached to and supported from suspended ceiling support system. Install additional support system rods or

wires at a minimum of 2 rods or wires for each fixture, located and connected at opposite fixture corners.

- 47. Install support clips for recessed fixtures, securely fastened to ceiling grid members, at or near each fixture corner.
- 48. Fixtures Smaller than Ceiling Grid: Install a minimum of 4 rods or wires for each fixture and locate at corner of ceiling grid where fixture is located. Do not support fixtures by ceiling acoustical panels.
- 49. Fixtures of Sizes Less than Ceiling Grid: Center in acoustical panel. Support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.
- FF. Support for Suspended Fixtures: Brace pendants and rods over 48 inches long to limit swinging. Support stem-mounted, single-unit, suspended fluorescent fixtures with twin-stem hangers. For continuous rows, use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of chassis, including one at each end.
- GG. Lamping: Where specific lamp designations are not indicated, lamp units according to manufacturer's instructions.

15.12 CONNECTIONS

- HH. Ground lighting units. Tighten electrical connectors and terminals, including grounding connections, according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

16.13 FIELD QUALITY CONTROL

- II. Inspect each installed fixture for damage. Replaced damaged fixtures and components.
- JJ. Tests: Verify normal operation of each fixture after fixtures have been installed and circuits have been energized with normal power source. Interrupt electrical energy to demonstrate proper operation of emergency lighting installation. Include the following information in tests of emergency lighting equipment:
 - 50. Duration of supply.
 - 51. Low battery voltage shutdown.
 - 52. Normal transfer to battery source and retransfer to normal.
 - 53. Low supply voltage transfer.
- KK. Replace or repair malfunctioning fixtures and components, then retest. Repeat procedure until all units operate properly.
- LL. Report results of tests.
- MM. Replace fixtures that show evidence of corrosion during Project warranty period.

17.14 ADJUSTING AND CLEANING

- NN. Clean fixtures after installation. Use methods and materials recommended by manufacturer.
- OO. Adjust aimable fixtures to provide required light intensities.

END OF SECTION 16515

SECTION 16525
EXTERIOR LIGHTING

PART 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 exterior lighting fixtures, lamps, ballasts, pole standards, and accessories.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 16 Section "Interior Lighting" for interior fixtures, lamps, ballasts, emergency lighting units, and accessories; also for exterior fixtures normally mounted on buildings.
 - 2. Division 16 Section "Lighting Control Equipment" for programmable lighting control systems, time switches, photoelectric relays, power relays, and contactors.

1.3 DEFINITIONS

- A. Fixture: A complete lighting device. Fixtures include a lamp or lamps and parts required to distribute light, position and protect lamps, and connect lamps to power supply.
- B. Lighting Unit: A fixture or an assembly of fixtures with a common support, including a pole or bracket plus mounting and support accessories.
- C. Luminaire: A fixture.

1.4 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data describing fixtures, lamps, ballasts, poles, and accessories. Arrange Product Data for fixtures in order of fixture designation. Include data on features, poles, accessories, finishes, and the following:
 - 1. Outline drawings indicating dimensions and principal features of fixtures and poles.
 - 2. Electrical Ratings and Photometric Data: Certified results of laboratory tests for fixtures and lamps.
- C. Poles
 - 1. Foundation drawings: Provide structural drawings of poles foundation sealed by a registered Arizona structural engineer.
 - 2. Wind Resistance Calculations: Certified by a registered professional engineer.
 - 3. Anchor-Bolt Templates: Keyed to specific poles and certified by manufacturer.

- D. Wiring diagrams detailing wiring for control system showing both factory-installed and field-installed wiring for specific system of this Project, and differentiating between factory-installed and field-installed wiring.
- E. Field test reports indicating and interpreting test results specified in Part 3 of this Section.
- F. Maintenance data for products to include in the operation and maintenance manual specified in Division 1.

1.5 QUALITY ASSURANCE

- A. Electrical Component Standard: Provide components that comply with NFPA 70 and that are listed and labeled by UL where available.
- B. Comply with ANSI C2.
- C. Listing and Labeling: Provide fixtures and accessories specified in this Section that are listed and labeled for their indicated use and installation conditions on Project.
 - 1. Special Listing and Labeling: Provide fixtures for use in hazardous (classified) locations that are listed and labeled for the specific hazard.
 - 2. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
- D. Fixtures for Hazardous Locations: Conform to UL 844. Provide units that have Factory Mutual Engineering and Research Corporation (FM) certification for indicated class and division of hazard.

1.6 STORAGE AND HANDLING OF POLES

- A. General: Store poles on decay-resistant treated skids at least 12 inches above grade and vegetation. Support pole to prevent distortion and arrange to provide free air circulation.
- B. Metal Poles: Retain factory-applied pole wrappings until just before pole installation. For poles with nonmetallic finishes, handle with web fabric straps.

1.7 WARRANTY

- A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Warranty: Submit a written warranty signed by manufacturer and Installer agreeing to replace external parts of lighting fixtures exhibiting a failure of finish as specified below. This warranty is in addition to, and not a limitation of, other rights and remedies the Owner may have under the Contract Documents.
 - 1. Protection of Metal from Corrosion: Warranty against perforation or erosion of finish due to weathering.
 - 2. Color Retention: Warranty against fading, staining, and chalking due to effects of weather and solar radiation.
 - 3. Special Warranty Period: 5 years from date of Substantial Completion.

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
 - 1. Lamps: 10 lamps for every 100 of each type and rating installed. Furnish at least one of each type.
 - 2. Glass and Plastic Lenses, Covers, and Other Optical Parts: 1 for every 100 of each type and rating installed. Furnish at least one of each type.
 - 3. Ballasts: 1 for every 100 of each type and rating installed. Furnish at least one of each type.
 - 4. Globes and Guards: 1 for every 20 of each type and rating installed. Furnish at least one of each type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the products specified in the Lighting Fixture Schedule on the plans.

2.2 FIXTURES AND FIXTURE COMPONENTS, GENERAL

- A. Metal Parts: Free from burrs, sharp edges, and corners.
- B. Sheet Metal Components: Corrosion-resistant aluminum, except as otherwise indicated. Form and support to prevent warping and sagging.
- C. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed fixtures.
- D. Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit relamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during relamping and when secured in operating position. Provide for door removal for cleaning or replacing lens. Arrange for door opening to disconnect ballast.
- E. Exposed Hardware Material: Stainless steel.
- F. Reflecting Surfaces: Minimum reflectances as follows, except as otherwise indicated:
 - 1. White Surfaces: 85 percent.
 - 2. Specular Surfaces: 83 percent.
 - 3. Diffusing Specular Surfaces: 75 percent.
- G. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
- H. Lenses and Refractors: Materials as indicated. Use heat- and aging-resistant, resilient gaskets to seal and cushion lens and refractor mounting in fixture doors.
- I. Fluorescent Fixtures: Conform to UL 1570.

- J. Fluorescent Ballasts: Class P, low-temperature, electromagnetic type, compatible with the lamps and lamp combinations to which connected.
 - 1. Certification by Electrical Testing Laboratory (ETL).
 - 2. Labeling by Certified Ballast Manufacturers Association (CBM).
 - 3. Sound Rating: "A" rating, except as otherwise indicated.
 - 4. Voltage: Match connected circuits.
 - 5. Minimum Power Factor: 90 percent.
 - 6. Total Harmonic Distortion (THD) of Ballast Current: Less than 20 percent.
 - 7. Conform to FCC Regulations Part 15, Subpart J for electromagnetic interference.
 - 8. Conform to IEEE C62.41, Category A, for resistance to voltage surges for normal and common modes.
 - 9. Minimum Starting Temperature: Minus 20 deg C.
- K. High-Intensity-Discharge (HID) Fixtures: Conform to UL 1572.
- L. HID Ballasts: Conform to UL 1029, and ANSI C82.4. Constant wattage autotransformer (CWA) or regulating high-power-factor type, unless otherwise indicated.
 - 1. Operating Voltage: Match system voltage.
 - 2. Single-Lamp Ballasts: Minimum starting temperature of minus 30 deg C.
 - 3. Open circuit operation will not reduce average life.
 - 4. High-Pressure Sodium (HPS) Ballasts: Equip with a solid-state igniter/starter having an average life in pulsing mode of 10,000 hours at an igniter/starter case temperature of 90 deg C.
 - 5. Noise: Uniformly quiet operation, with a noise rating of B or better.
- M. Incandescent Fixtures: Conform to UL 1571.
- N. Lamps: Comply with ANSI C78 series that is applicable to each type of lamp. Provide fixtures with indicated lamps of designated type, characteristics, and wattage. Where a lamp is not indicated for a fixture, provide medium wattage lamp recommended by manufacturer.

2.3 FIXTURE SUPPORT COMPONENTS

- A. Pole-Mounted Fixtures: Conform to AASHTO LTS-3.
- B. Wind-load strength of total support assembly, including pole, arms, appurtenances, base, and anchorage, is adequate to carry itself plus fixtures indicated at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of 100 mi./h with a gust factor of 1.3.
- C. Arm, Bracket, and Tenon Mount Materials: Match poles' finish.
- D. Mountings, Fastenings, and Appurtenances: Corrosion-resistant items compatible with support components. Use materials that will not cause galvanic action at contact points. Use mountings

that correctly position luminaire to provide indicated light distribution.

- E. Pole Bases: Anchor type with galvanized steel hold-down or anchor bolts, leveling nuts, and bolt covers.
- F. Poles: Steel tubing conforming to ASTM A 500, Grade B, carbon steel with a minimum yield of 46,000 psi. Poles are 1-piece construction up to 40 feet in length and have access handhole in wall.
- G. Metal Pole Grounding Provisions: Welded 1/2-inch threaded lug, accessible through handhole.
- H. Metal Pole Brackets: Designed to match pole metal. Provide cantilever brackets without underbrace, in sizes and styles indicated, with straight tubular end section to accommodate fixture.
- I. Pole-Top Tenons: Fabricated to support fixture or fixtures and brackets indicated and securely fastened to pole top.
- J. Concrete for Pole Foundations: Comply with Division 3 Section "Cast-in-Place Concrete." Use 3000-psi strength, 28-day concrete.

2.4 FINISHES

- A. Metal Parts: Manufacturer's standard finish, except as otherwise indicated, applied over corrosion-resistant primer, free of streaks, runs, holidays, stains, blisters, and similar defects.
- B. Other Parts: Manufacturer's standard finish, except as otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Set units plumb, square, level, and secure according to manufacturer's written instructions and approved Shop Drawings.
- B. Concrete Foundations: Construct according to Division 3 Section "Cast-in-Place Concrete."
 - 1. Comply with details and manufacturer's recommendations for reinforcing, anchor bolts, nuts, and washers. Verify anchor-bolt templates by comparing with actual pole bases furnished.
 - 2. Finish: Trowel and rub smooth parts exposed to view.
- C. Fixture Attachment: Fasten to indicated structural supports.
- D. Fixture Attachment with Adjustable Features or Aiming: Attach fixtures and supports to allow aiming for indicated light distribution.
- E. Lamp fixtures with indicated lamps according to manufacturer's written instructions. Replace malfunctioning lamps.

3.2 GROUNDING

- A. Ground fixtures and metal poles according to Division 16 Section "Grounding."

3.3 FIELD QUALITY CONTROL

- A. Inspect each installed unit for damage. Replace damaged fixtures and components.
- B. Give advance notice of dates and times for field tests.
- C. Provide instruments to make and record test results.
- D. Tests and Observations: Verify normal operation of lighting units after installing fixtures and energizing circuits with normal power source. Include the following:
 - 1. Photometric Tests: Measure light intensities at night at locations where specific illumination performance is indicated. Use photometers with calibration referenced to National Institute of Standards and Technology (NIST) standards.
 - 2. Check for intensity of illumination.
 - 3. Check for uniformity of illumination.
 - 4. Check for excessively noisy ballasts.
 - 5. Prepare written report of tests indicating actual illumination results.
- E. Replace or repair damaged and malfunctioning units, make necessary adjustments, and retest. Repeat procedure until all units operate properly.

3.4 ADJUSTING AND CLEANING

- A. Clean units after installation. Use methods and materials recommended by manufacturer.
- B. Adjust aimable fixtures to provide required light intensities.

END OF SECTION 16525

SECTION 16660 - GROUND-FAULT PROTECTION SYSTEMS

PART 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 ground-fault sensing, relaying, tripping, and alarm devices for installation in distribution switchboards and panelboards rated 600 volts and less.

1.3 SYSTEM DESCRIPTION

- A. Sensing Method: Protect main disconnecting means using outgoing-circuit sensing method.
- B. Feeders: Protect as indicated using outgoing-circuit sensing method.
 - 1. Selectivity: Time-current-band method with 0.2-second minimum difference between upstream and downstream device settings.
- C. Design ground-fault system that cannot be left in an inactive, or off state.

1.4 SUBMITTALS

- A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.
- B. Product data for each component.
- C. Wiring diagrams detailing power and control wiring and differentiating clearly between manufacturer-installed wiring and field-installed wiring.
- D. Qualification data for firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of Architects and Owners, and other information specified.
- E. Field test reports indicating and interpreting test results relative to compliance with performance requirements of ground-fault protection system.
- F. Maintenance data for ground-fault relay, for inclusion in Operating and Maintenance Manual specified in Division 1.

1.5 QUALITY ASSURANCE

- A. Testing Firm Qualifications: In addition to the requirements specified in Division 1 Section "Quality Control Services," an independent testing firm shall meet OSHA criteria for accreditation of testing laboratories, Title 29, Part 1907, or shall be a full member company of the International Electrical Testing Association.
 - 1. Testing Firm's Field Supervision: Use persons currently certified by the International

Electrical Testing Association or National Institute for Certification in Engineering Technologies, to supervise on-site testing specified in Part 3.

- B. Comply with NFPA 70, "National Electrical Code," for components and installation.
- C. Listing and Labeling: Provide products specified in this Section that are listed and labeled.
 - 1. The Terms "Listed and Labeled": As defined in the "National Electrical Code," Article 100.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide ground-fault protection components by one of the following:
 - 1. Siemens
 - 2. General Electric Company.
 - 3. Cutler Hammer
 - 4. Square D Co.

2.2 GROUND-FAULT SENSING DEVICES

- A. Outgoing-Circuit Current Sensors: Current transformer with rectangular windows for circuits requiring outgoing-circuit sensing method. Use single transformer per circuit, or multiple transformers with identical ratios, to measure vectorial sum of currents in all conductors, including neutral, of a circuit.
- B. Ground-Return Current Sensors: Current transformer suitable for encircling main bonding jumper connection between system neutral and grounding electrode conductor.
- C. Short-Circuit Rating: 200,000 amperes rms symmetrical.
- D. Outputs: Compatible with relay inputs.
- E. Split-Core Construction: Construct sensor to allow installation and removal without disturbing the electrical conductors being encircled.
- F. Provide test windings in sensor for testing the operation of ground-fault protection unit, including sensor pick-up, relay, and circuit-protection devices.

2.3 GROUND-FAULT RELAYS AND MONITORS

- A. Ground-Fault Relay: Solid-state type that requires no external source of electrical power for relay operation, drawing control power from output of current sensor.
 - 1. Testing and Tripping Voltage: 120 volts AC, from external source.
 - 2. Pick-up Current Sensitivity: Adjustable range from 100 to 1200 amperes, with calibrated dial to show pick-up point settings.

3. Time Delay: Field adjustable from instantaneous to 1 second, and designed to prevent tampering with setting.
 4. Component Classification: UL 1053, Class II.
 5. Output Circuit: Compatible with ratings of disconnect tripping coils.
- B. Monitor Panels: Include ground-fault indicators, control-power indicators, and test and reset buttons. Arrange to allow testing with and without tripping.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install ground-fault sensing windows symmetrically encircling power conductor bus bars or cables. Maintain clearances between conductors and ground-fault sensor body as recommended by device manufacturer.
- B. Provide grounding connections for ground-fault protection systems and components as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals according to tightening torques specified in UL Standard 486A.

3.2 FIELD QUALITY CONTROL

- A. Testing Firm: Provide the services of a qualified independent testing firm to perform field quality control testing.
- B. Testing: Upon completion of installation of ground-fault protection system and after electrical circuitry has been energized, demonstrate capability and compliance with requirements.
 1. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA Standard ATS, Section 7.14. Certify compliance with test parameters.
- C. Correct malfunctioning units at site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

3.3 ADJUSTING

- A. Set field-adjustable pick-up and time-sensitivity ranges as indicated.
- B. Perform short-circuit analysis and coordination study. Set field-adjustable pick-up and time-sensitivity ranges accordingly.

END OF SECTION 16660

SECTION 16740

VOICE AND DATA SYSTEMS (Conduit Only)

PART 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 signal pathways and raceways for voice and high-speed data transmission (conduit only.).

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for each component specified, including detailed manufacturer's specifications. Include data on features, ratings, and performance. Include dimensioned plan and elevation views of components. Show access and working-space requirements.
- C. Evidence of listing of products specified to be listed in the "Quality Assurance" Article.

1.4 QUALITY ASSURANCE

- A. Listing and Labeling: Provide products specified in this Section that are listed and labeled.
 - 1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

PART 2 - PRODUCTS

2.1 WIRING PATHWAY AND EQUIPMENT MOUNTING ELEMENTS

- A. Cable Trays: Comply with Division 16 Section "Cable Trays."
- B. Raceways, Boxes, and Cabinets: Comply with Division 16 Section "Raceways, Boxes, and Cabinets."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine pathway elements to receive cable. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install components as indicated, according to manufacturers' written instructions.

3.4 GROUNDING

- A. Comply with Division 16 Section "Grounding."
- B. Signal Ground Terminal: Locate at each equipment room and wiring closet. Isolate from power system and equipment grounding.
- E. Install grounding electrodes of type, size, location, and quantity as indicated. Comply with installation requirements of Division 16 Section "Grounding."
- F. Signal Ground Bus: Mount on wall of main equipment room with stand-off insulators.
- G. Signal Ground Backbone Cable: Extend from signal ground bus to signal ground terminal in each wiring closet and equipment room.

3.5 INSTALLATION AT EQUIPMENT ROOMS AND WIRING CLOSETS

- A. Line walls with plywood backboards, floor to ceiling.

3.6 IDENTIFICATION

- A. Identify system components in compliance with the applicable requirements of Division 16 Section "Basic Electrical Materials and Methods" and the following specifications:

3.7 CLEANING

- A. On completion of system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

END OF SECTION 16740

SECTION 16915 - LIGHTING CONTROL EQUIPMENT

1. PART 1 - GENERAL

1.A. RELATED DOCUMENTS

2. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

2.A. SUMMARY

3. This Section includes the following types of lighting controls:
 - 4.A.1.i.1.1.1. Manual and integrated, multipreset, modular dimming systems.
 - 4.A.1.i.1.1.2. Multichannel, remote-controlled dimming systems.
 - 4.A.1.i.1.1.3. Programmable, low-voltage lighting control systems.
 - 4.A.1.i.1.1.4. Time switches.
 - 4.A.1.i.1.1.5. Photoelectric relays.
 - 4.A.1.i.1.1.6. Occupancy sensors.
 - 4.A.1.i.1.1.7. Low-voltage control system components.
 - 4.A.1.i.1.1.8. Lighting relays and contractors.
 - 4.A.1.i.1.1.9. Remote-control stations.
5. Related Sections: The following Sections contain requirements that relate to this Section:
6. Division 16 Section "Basic Electrical Materials and Methods" for general component identification and support requirements.
7. Division 16 Section "Wiring Devices" for individual dimmer switches.
9. Division 16 Section "Theatrical Lighting" for lighting controls for theatrical lighting.

9.A. SUBMITTALS

10. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
11. Submit Product Data for lighting control equipment and systems components, including dimensions and data on features and components. Include wiring diagrams and elevation views of front panels of control and indicating devices. Include data on ratings. For flush control panels, submit color and finish options for selection. Also include the following:
 - 11.A.1.i.1.1.1. Lists of ballast and lamp combinations compatible with dimmer systems, by manufacturer and catalog number.
 - 11.A.1.i.1.1.2. Sound data, including operational tests of dimming systems.

11.A.1.i.1.1.3. Operational documentation for software.

12. Shop Drawings detailing assemblies of standard components, custom assembled for specific application on Project. Indicate dimensions, weights, arrangement of components, and clearance and access requirements.
13. Wiring diagrams detailing specific systems tailored to this Project and differentiating between factory-installed and field-installed wiring.
14. Maintenance data for lighting control equipment and systems components to include in the operation and maintenance manual specified in Division 1.

14.A. QUALITY ASSURANCE

15. Electrical Component Standard: Provide components that comply with NFPA 70 and that are listed and labeled by UL where available.
16. Comply with FCC Regulations of Part 15, Subpart J for Class A.
17. Listing and Labeling: Provide products specified in this Section that are listed and labeled.
18. The Terms "Listed" and "Labeled": As defined in the "National Electrical Code," Article 100.

18.A. WARRANTY

19. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
20. Special Warranty: Submit a written warranty signed by manufacturer and Installer agreeing to replace programmable lighting control system components that fail in materials or workmanship within the specified warranty period.
21. Warranty Period: 2 years from date of Substantial Completion.

22. PART 2 - PRODUCTS

22.A. MANUFACTURERS

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

23.A.1.i.1.1.1. Manual and Integrated, Multipreset, Modular Dimming Systems:

- 23.A.1.i.1.1.1.1. Lightolier, Inc.
- 23.A.1.i.1.1.1.1.2. Lithuania Lighting.
- 23.A.1.i.1.1.1.1.3. Lutron Electronics Co., Inc.
- 23.A.1.i.1.1.1.1.4. USI Industries, Inc.; Prescolite, Inc.

23.A.1.i.1.1.2. Multichannel, Remote-Controlled Dimming Systems:

- 23.A.1.i.1.1.2.1. Lightolier, Inc.
- 23.A.1.i.1.1.2.2. Lithuania Lighting.
- 23.A.1.i.1.1.2.3. Lutron Electronics Co., Inc.
- 23.A.1.i.1.1.2.4. Strand Lighting.

- 23.A.1.i.1.1.3. Programmable, Low-Voltage Lighting Control Systems:
 - 23.A.1.i.1.1.3.1. GE Lighting Controls.
 - 23.A.1.i.1.1.3.2. Lithonia Lighting.
 - 23.A.1.i.1.1.3.3. Lutron Electronics Co., Inc.
 - 23.A.1.i.1.1.3.4. Square D Co.

- 23.A.1.i.1.1.4. Contactors and Relays:
 - 23.A.1.i.1.1.4.1. Automatic Switch Co.
 - 23.A.1.i.1.1.4.2. Challenger Electrical Equipment Corp.
 - 23.A.1.i.1.1.4.3. Eaton Corporation, Cutler-Hammer Products.
 - 23.A.1.i.1.1.4.4. GE Lighting Controls.
 - 23.A.1.i.1.1.4.5. Square D Co.
 - 23.A.1.i.1.1.4.6. Zenith Controls, Inc.

- 23.A.1.i.1.1.5. Time Switches:
 - 23.A.1.i.1.1.5.1. Intermatic, Inc.
 - 23.A.1.i.1.1.5.2. Leviton Manufacturing Co., Inc.
 - 23.A.1.i.1.1.5.3. Paragon Electric Co., Inc.
 - 23.A.1.i.1.1.5.4. Zenith Controls, Inc.

- 23.A.1.i.1.1.6. Photoelectric Relays:
 - 23.A.1.i.1.1.6.1. Fisher Pierce.
 - 23.A.1.i.1.1.6.2. Intermatic, Inc.
 - 23.A.1.i.1.1.6.3. Paragon Electric Co, Inc.
 - 23.A.1.i.1.1.6.4. SSAC, Inc.

- 23.A.1.i.1.1.7. Occupancy Sensors:
 - 23.A.1.i.1.1.7.1. Bryant Electric, Inc.; Westinghouse Electric Corp. Div.
 - 23.A.1.i.1.1.7.2. Hubbell Lighting, Inc.
 - 23.A.1.i.1.1.7.3. Watt Stopper, Inc. (The).

23.B. LIGHTING CONTROL EQUIPMENT, GENERAL

- 24. Include line-voltage surge protection in all solid-state equipment. Comply with UL 1449 and ANSI C62.41.
- 25. Load Compatibility: Components compatible with each other and with controlled loads.
- 26. Dimmers and Dimmer Modules: Comply with UL 508.
- 27. Noise and Radio Frequency Interface (RFI) Suppression: Solid-state dimmers operate smoothly over their operating ranges without audible lamp noise or RFI at any setting. Modules include integral or external filters that provide audible noise and RFI suppression.
- 28. Dimmer or Dimmer Module Rating: As indicated, but not less than 125 percent of connected load.

29.A. MANUAL, MODULAR DIMMING SYSTEMS

30.Description: Factory-fabricated equipment providing 1 to 4 channels of manual dimming control. Integrate controls and dimmers for mounting in a 2- or 3-gang wall box under a single wall plate.

31.Module Dimming Capability: Listed for control of type of lighting unit used.

31.A.1.i.1.1.1. Fluorescent Dimmers: Control lights smoothly over a minimum range of 100 to 1 percent of full brightness.

32.Unit Rating: 1900 W, minimum, with each dimming channel rated 600 W, minimum.

32.A. INTEGRATED, MULTIPRESET, MODULAR DIMMING SYSTEMS

33.Description: Microprocessor-based, solid-state controlled system.

34.Operation: Automatically changes variable dimmer settings of different groups of lights (channels) simultaneously from one preselected setting to another when a push button is operated.

35.Each system includes a control panel and 1 to 4 dimmer-control modules that are integrally flush mounted in a single wall box.

36.Control panel adjusts each dimmer channel settings for each scene and commands change from one preset scene to another. Control positions or displays at control panel indicate dimmer settings for each channel for each scene.

37.Timed cross-fading action occurs when one preset scene is switched to another.

37.A. MULTICHANNEL, REMOTE-CONTROLLED DIMMING SYSTEMS

38.Description: Microprocessor-based, solid-state controls and low-voltage control signals change dimmer settings of remote dimmer modules. Dimmer modules change intensities of different groups of lights (channels) from one preset scene to another. System includes modular dimmer cabinets and separately mounted control panels.

39.Control panels adjust dimmer channel settings and command change from any one preset scene to another. Displays at control panel indicate dimmer settings for each channel for each scene. Panels are flush-mounted push-button and display units and have finish colors as approved.

40.Change from one preset scene to another is accomplished by a timed fading action, adjustable over a range of at least 1 to 240 seconds, and is separately programmable for each preset.

41.Dimmer Cabinet: Factory wired and convection cooled without fans.

42.Dimmer Modules: Plug-in type, automatically disconnected by an air-gap relay when switched off or set to minimum intensity. Units withstand power line surges of 6000 V, 3000 A according to ANSI C62.41.

43.Non-dim modules include relays air-gap rated for continuous duty at 20 A.

44.Filtering of each dimmed circuit at 50 percent rated dimmer capacity provides a minimum 350-microsecond current rise time at a 90-degree conduction angle. At any load within rating, rate of current rise does not exceed 30 mA/microsecond, measured from 10 to 90 percent of load current wave form.

45.Power-Failure Memory Feature: Retain programming for a minimum of 90 days after power failure.

When power is restored, return intensities of dimmed lights for each scene to levels set before failure.

47. Remote signals from programmable lighting control system change one preset setting to another.

47.A. PROGRAMMABLE, LOW-VOLTAGE LIGHTING CONTROL SYSTEMS

48. General: Conform to UL 916.

51. System Control Module Description: Microprocessor-based, solid-state, 365-day timing and control unit. Unit is programmable for control of indicated number of output circuits. Output circuits are switched on or off by internally programmed time signals or by analog or digital signals from external sources. System output circuits are pilot-duty relay type, capable of operating latching-type single-pole lighting circuit relays, multipole lighting contactors, and other devices, all located in other enclosures. System is programmed with an integral keyboard. Keyboard use is protected by locked cover and security access code. Manual control and programming steps are viewed on an alphanumeric display. Modules include the following features:

53. System Control Module Description: Microprocessor-based control unit receives programming from hand-held programmer. Control units include a solid-state, programmable, 365-day timing unit that can receive inputs from other indicated sensors and sources. Output circuits are pilot-duty relay circuits, capable of operating latching-type single-pole lighting circuit relays, multipole lighting contactors, and other devices. Output circuits also include digital circuits arranged to transmit control commands to remote preset dimmers. Modules include the following features:

55. System Control Module Description: Panelboard using low-voltage, controlled, electrically operated, molded-case circuit breakers as prime output circuit device. Circuit breakers and a limited number of digital or analog, low-voltage control circuit outputs are individually controlled by microprocessor-based control unit installed in panelboard. Control unit receives inputs from indicated sensors and other sources. Line-voltage components and wiring are separated from low-voltage components and wiring by barriers. Control unit is locally programmable. Modules include the following features:

57. System Control Module Description: Programmable, microprocessor-based control unit mounted in preassembled modular relay panel. Low-voltage, controlled, latching-type, single-pole lighting circuit relays are prime output circuit devices. Where indicated, a limited number of digital or analog, low-voltage control circuit outputs are supported by control unit and circuit boards associated with each relay. Control unit receives inputs from indicated sensors and other sources. Line-voltage components and wiring are separated from low-voltage components and wiring by barriers. Control unit is locally programmable. Modules include the following features:

58.A.1.i.1.1.1. System Memory: Nonvolatile. Reboots program and resets time automatically without errors after power outages up to 90 days' duration.

58.A.1.i.1.1.2. Automatic Adjustment: System automatically adjusts for leap year and daylight savings time and provides weekly routine and annual holiday scheduling.

58.A.1.i.1.1.3. Astronomic Control: Automatic adjustment of dawn and dusk switching.

58.A.1.i.1.1.4. Confirmation: Each relay, contactor, and other control device operated by system has auxiliary contacts connected to provide a confirmation signal to system of on or off status of device.

59.A.1.i.1.1.1.1. Software interprets status signals, provides for their display, and initiates failure signals.

59.A.1.i.1.1.1.2. Lamp or light-emitting diode (LED) at control module or display panel identifies status of each controlled circuit.

- 60.Remote Communications Capability: Allows programming, data-gathering interrogation, status display, and controlled command override from an IBM-compatible microcomputer at a remote location over telephone or data lines. System includes modem, communications and control software, and remote computer compatibility verification for this purpose. Microcomputer is not in this Contract. Override programmed lighting shutdown commands by telephoning computer and entering an override touch-tone code specific to zone to be controlled.
- 61.Local Override Capability: Manual, low-voltage control devices override programmed shutdown of lighting and other programmed control for intervals that may be programmed as to duration.
- 62Automatic battery back-up provides power to maintain program and system clock operation for 90 days' minimum duration when power is off.
- 63.Compatibility with dimmer controls permits commands that change preset scenes and dimmer settings according to programmed signals.
- 64.Flick Warning: Programmable momentary turnoff of lights warns that programmed shutoff will occur in 5 minutes. Warning is repeated 5 minutes before end of programmed override period.
- 65.Diagnostics: When system operates improperly, software initiates factory-programmed diagnosis of failure and displays messages identifying problem and possible causes.

65.A. CONTACTORS AND RELAYS

- 66.Comply with NEMA ICS 2.
- 67.Description: Devices are electrically operated and mechanically held. Number of poles and ratings are as indicated. Coordinate rating of each unit with type of load served, including tungsten filament and inductive-type loads.
- 68.Modular Single-Pole Relays: Split-coil, momentary-pulsed type, knockout mounting.
- 69.Low-Voltage Leads: 5-pin plug connector.
- 70.Pilot Contacts: Single pole.
- 71.Rated Capacity: 20 A, 125 VAC for tungsten filaments, and 20 A, 277 VAC for ballasts.
- 72.Endurance: 50,000 cycles at rated capacity.
- 73.Modular Relay Panels: Steel cabinets, preassembled with modular single-pole relays, transformer power supplies, and associated components.
- 74.Barriers separate low-voltage and line-voltage components.
- 75.Cover: Hinged, lockable type.
- 76.Directory: Mounted on back of door. Identifies relays and loads controlled.

76.A. TIME SWITCHES

78. Time Switches: Solid-state programmable units with alphanumeric display conforming to UL 917. Include the following features:

79. Time Switches: Electromechanical-dial type conforming to UL 917. Include the following features:

79.A.1.i.1.1.1. Astronomic dial.

79.A.1.i.1.1.2. Contacts: 2, rated 30 A at 277 VAC, except as otherwise indicated.

79.A.1.i.1.1.3. Pilot-Duty Contacts: 2, rated 2 A at 240 V, except as otherwise indicated.

79.A.1.i.1.1.4. Eight-Day Program: Uniquely programmable for each day of the week and holidays.

79.A.1.i.1.1.5. Skip-day mode.

79.B. PHOTOELECTRIC RELAYS

81. Conform to UL 773A.

82. Type: Solid-state, with SPDT dry contacts rated to operate relay or contactor coils to which connected.

83. Time delay prevents false operation.

84. Indoor Ceiling- or Wall-Mounted Units: Semiflush, calibrated to detect adequacy of daylighting in perimeter locations and arranged to turn artificial illumination on and off to suit varying intensities of available daylighting. Units are adjustable for turn-on/turn-off levels.

85. Indoor Skylight Units: Housed in a threaded plastic fitting for mounting under skylight, suitable for monitoring light levels from 0 to 3500 foot candles (0 to 37 673 lux), with an adjustment for turn-on/turn-off levels.

86. Outdoor Sealed Units: Weathertight housing, resistant to high temperatures and equipped with sun-glare shield and ice preventer.

87.A. OCCUPANCY SENSORS

88. General: Designed for type of mounting and space detection coverage requirements indicated. Connected to receive power from and operate a light switching relay in a separately mounted auxiliary power control unit, except as otherwise indicated.

89. Operation: Turns lights on when room or covered area is occupied and off when unoccupied, except as otherwise indicated.

89.A.1.i.1.1.1. Time Delay for Turning Lights Off: Adjustable.

91. Ambient-Light-Level Control: Adjustable to set a level of ambient illumination above which sensor will not turn lights on.

93. Isolated Relay Contact: Operates on detection of occupancy to activate an independent function.

94. Auxiliary Power Control Units: Relays are rated for a minimum of 20-A ballast load or 13-A tungsten lamp load. Sensor power supply is rated to supply number of sensor heads to which it is connected.

96. Passive Infrared Type: Occupancy is detected by a combination of heat and movement in zone of

coverage. Each sensing head detects occupancy anywhere in an area of 1000 sq. ft. by detecting occurrence of 6-inch minimum movement of any portion of a human body that presents a minimum target of 36 sq. in. to sensor head.

97. Ultrasonic Type: Unit emits a beam of ultrasonic energy and detects occupancy through use of doppler principle in discerning movement in zone of coverage by sensing a change in pattern of reflected ultrasonic energy.

98. Dual-Technology Type: Unit uses a combination of passive infrared and ultrasonic detection methods to distinguish between occupied and unoccupied conditions for area covered. Particular technology or combination of technologies that controls each function (on or off) is selectable in field by operating controls on unit.

98.A. MANUAL SWITCHES AND PLATES

99. Switches: Specification grade, modular, momentary push-button, low-voltage type.

99.A.1.i.1.1.1. Color: White, except as otherwise indicated.

101. Integral Pilot Light: Indicates when circuit is on. Use where indicated.

102. Locator Light: Internal illumination helps locate switch in the dark. Use where indicated.

103. Wall Plates: Match those specified in Division 16 Section "Wiring Devices" to materials, finish, and color. Use multigang plates where more than one switch is indicated at a location.

104. Legend: Engraved or permanently silk-screened on wall plate where indicated. Use designations indicated on Drawings.

104.A. LOW-VOLTAGE WIRING

105. Digital and Multiplexed Signal Wire: Shielded, twisted-pair cable as specified in Division 16 Section "Voice and Data Systems."

106. Low-Voltage Control Cable: Multiple conductor, color coded, No. 20 AWG copper.

106.A.1.i.1.1.1. Sheath: Polyvinyl chloride (PVC), except in plenum-type spaces. In plenum-type spaces, use sheath listed for such use.

106.A.1.i.1.1.2. Ordinary Switch Circuits: 3 conductors, except as otherwise indicated.

106.A.1.i.1.1.3. Switch Circuits with Pilot Lights or Locator Feature: 5 conductors, except as otherwise indicated.

107. PART 3 - EXECUTION

107.A. INSTALLATION

108. Install equipment according to manufacturers' written instructions.

109. Mount control equipment according to manufacturers' instructions and Division 16 Section "Basic Electrical Materials and Methods."

110. Mounting heights indicated are to bottom of unit for suspended items and to center of unit for wall-mounted ones.

110.A.CONTROL WIRING INSTALLATION

111. Install wiring between control devices as specified in Division 16 Sections "Wires and Cables" for low-voltage connections, and "Voice and Data Systems" for digital circuits.
113. Wiring Method: Install all wiring in raceway as specified in Division 16 Section "Raceways, Boxes, and Cabinets."
114. Wiring Method: Install all wiring in raceway as specified in Division 16 Section "Raceways, Boxes, and Cabinets" except where run in accessible ceiling space, and gypsum board partitions.
115. Bundle, train, and support wiring in enclosures.
116. Grounding: Ground equipment. Tighten electrical connectors and terminals, including grounding connections, according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

116.A.IDENTIFICATION

117. Identify components and power and control wiring according to Division 16 Section "Electrical Identification."
118. Label each system control module with a unique designation. Make designations on elevated components readable from floor.

118.A.FIELD QUALITY CONTROL

119. Manufacturer's Field Services: Provide services of a factory-authorized service representative to test, adjust, and program lighting control systems.
120. Reports: Prepare written reports of tests and observations. Report defective materials and workmanship and unsatisfactory test results. Record repairs and adjustments.
121. Test Labeling: After satisfactory completion of tests and inspections, apply a label to tested components indicating test results, date, and responsible organization and person.
122. Schedule visual and mechanical inspections and electrical tests with at least 7 days' advance notice.
123. Visual and Operational Inspections: Include the following inspections:
- 123.A.1.i.1.1.1. Inspect control components for defects and physical damage, NRTL labeling, and nameplate compliance with current Project Drawings.
 - 123.A.1.i.1.1.2. Check tightness of electrical connections with torque wrench calibrated within previous 6 months. Use manufacturer's recommended torque values.
 - 123.A.1.i.1.1.3. Verify settings of photoelectric devices with photometer calibrated to National Institute for Science and Technology (NIST) standards

within past 6 months.

123.A.1.i.1.1.4. Exercise and perform operational tests on mechanical parts and operable devices according to manufacturer's instructions for routine functional operation.

124. Electrical Tests: Use particular caution when testing devices containing solid-state components. Perform the following tests according to manufacturer's instructions:

125. Continuity tests of circuits.

126. Operational Tests: Set and operate controls to demonstrate controls in a methodical sequence that cues and reproduces actual operating functions. Include testing of dimming equipment and ambient-light, programmable, and occupancy controls under conditions that simulate actual operational conditions. Record control settings, operations, cues, and functional observations.

127. Correct deficiencies disclosed by inspections and tests, make necessary adjustments, and retest deficient items. Verify that specified requirements are met.

127.A.ADJUSTING AND CLEANING

128. Occupancy Adjustments: Upon request within 1 year of date of Substantial Completion, make up to 3 on-site visits to Project site to assist in adjusting light levels, making program changes, and adjusting sensors and controls.

129. Repair scratches and mars of finish to match original finish. Clean equipment and devices internally and externally using methods and materials recommended by manufacturers.

129.A.DEMONSTRATION

130. Training: Provide services of a factory-authorized service representative to demonstrate programmable lighting control system and to train Owner's maintenance personnel.

131. Train Owner's personnel to operate, service, maintain, adjust, and program equipment and system components. Allow at least 4 hours to conduct training. Schedule training with at least 7 days' advance notice. Use final approved operation and maintenance manual as a training aid throughout training. Use both classroom training and hands-on exercises.

99ASU041

131.A.1.i.1. END OF SECTION 16915

SECTION 31 01 00

EARTHWORK

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Site preparation and grading.
 - 2. Building excavating and backfilling.
 - 3. Trenching, backfilling and compacting for building utilities.
 - 4. Excavation and grading for site paving, curbs and sidewalks.
- B. Related Sections:
 - 1. Section 03 30 00 - Cast-in-Place Concrete: Subslab vapor retarder membrane.

1.02 DEFINITIONS

- A. Native or natural soils: Undisturbed soils present at site in their natural state or conditions. Materials which are essentially free of vegetation or organic matter and do not include trash or other deleterious materials.
- B. Existing fill soils: Materials present at site that have been disturbed, possibly transported, and are not in their natural undisturbed state.
- C. Imported fill soils: Materials transported onto site.
- D. Granular material: A sandy type of soil whose particles are coarser than cohesive material and which do not stick to each other.
- F. Finished Grade: Floor level for interior footings, and the lowest adjacent grade (either floor level or outside grade) within 5'-0" of foundations for perimeter wall or exterior column footings.
- G. Building Perimeter: The extreme outer edge of footing. This location of the building perimeter is to be used in determining the required lateral extent of engineered fill.
- H. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within building lines.

1.03 SUBMITTALS

- A. Test Reports:
 - 1. Submit test results for imported fill materials to be used (if required), directly to the testing laboratory with a copy to Architect in accordance with Section 01 45 00.
 - 2. Test results shall clearly indicate:
 - a. Types of materials and composition.
 - b. Hardness
 - c. Compactability.
 - d. Presence of organic contaminants, whether or not below EPA action levels.

- e. Presence of hazardous and/or regulated wastes and contaminants, whether or not below EPA action levels.
 - f. Suitability for proposed usage.
- 3. Testing laboratory shall notify Architect of non-conforming fill material submittals.
- B. As-Built Drawings:
 - 1. Maintain previously recorded utilities and accurately record location of:
 - a. Newly encountered utilities remaining.
 - b. Rerouted utilities.
 - c. New utilities by horizontal dimensions, elevations or inverts, and slope gradients.
 - 2. Submit in accordance with Section 01 77 00.

1.04 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with applicable Federal, State and local ordinances, including Arizona Highway Department Standard Specifications. Where geotechnical report, General Structural Notes, or notes on drawings state more restrictive requirements, the requirements of the geotechnical report, General Structural Notes, or notes on drawings shall govern.
- B. Staking: Staking shall be performed by a Civil Engineer or Land Surveyor currently registered in the state where the Project is located. One person only shall be responsible for staking the Project, however, additional staff may be used (under direct supervision of responsible person) for larger projects.
- C. Existing Utilities: Perform site survey, research public utility records, and verify existing utility locations. Contact the following utility locating service (Blue Stake Service) to locate, stake, flag and/or mark locations of utilities:
 - 1. Arts Locating; Art Espitia (928) 713-3946.
- D. Observation of Geotechnical Engineer: Every phase of the earthwork shall be performed under observation and testing directed by the Geotechnical Engineer.

1.05 SITE CONDITIONS

- A. Existing Conditions: Bidders are expected to visit the site to form their own conclusions as to the character of the Work under this Section.
- B. Environmental Requirements: Place, spread or roll fill materials during favorable weather conditions. When the Work is interrupted by rain, do not resume fill operations until evidence is furnished which establishes that moisture content and density of the previously placed fill are as specified.
 - 1. Surface drainage: Provide and maintain positive surface drainage during excavation. Prevent infiltration of water into utility or foundation excavations from whatever sources as may exist.
 - 2. Dust control: Comply with requirements of governing authorities. Use whatever means necessary to control dust on and near the Work and on and near off-site borrow, storage and spoil areas, if such dust is caused by the Contractor's operations during performance of the Work, or if resulting from the conditions in which the Contractor leaves the site. Thoroughly moisten surfaces as required to prevent dust being a nuisance to the public, neighbors, and concurrent performance of other Work on the site.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Fill Soil:
 - 1. Inorganic soils free of vegetation, debris, organic contaminants, and fragments larger than 6 inches in size, unless otherwise indicated or specified.
 - 2. Imported fill materials:
 - a. Low expansive potential.
 - b. Used in new fill, backfill or recompacted bearing soil section below concrete slabs of shallow foundation in areas below buildings and exterior slabs.
 - c. Within the following limits:
 - (1) Maximum particle size: 6 inches in size, unless otherwise indicated or specified.
 - (2) Maximum expansion: 1.5 percent performed on sample remolded to 95 percent of the maximum ASTM D698 density and 2 percent below optimum moisture under a 100 psf surcharge pressure.
- B. Under-Slab Fill: Aggregate Base (ABC) conforming with material requirements of MAG Section 702.
- C. Pipe Bedding Fill: Granular material containing no pieces larger than 1-1/2 inches and free of broken concrete, broken pavement, wood or other deleterious material. Open graded rock shall not be used.
- D. Warning Tape:
 - 1. Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility.
 - 2. Provide detectable warning tape with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 2'-6" deep for non-metallic utility pipes, conduit or other underground services outside of building line.
 - 3. Tape Colors: Provide tape colors to utilities as follows:
 - a. Red: Electric.
 - b. Yellow: Gas, oil, steam, and dangerous materials.
 - c. Orange: Telephone and other communications.
 - d. Blue: Water systems.
 - e. Green: Sewer systems.

PART 3 EXECUTION

3.01 PREPARATION

- A. Verify survey data. Stake out work and verify as to location and elevation. Carefully maintain bench marks, monuments, and other reference points; if disturbed or destroyed, replace as directed.
- B. Site Clearing: Strip and remove all vegetation and deleterious material within the proposed building and parking areas.

- C. Following removal of the above listed items; scarify, moisture process and properly compact existing native surface soils in accordance with recommendations of the Civil and/or Structural Engineer.
- D. Prepare subgrade for slabs in accordance with recommendations of the Civil and/or Structural Engineer.
- E. Over-excavate existing native soils beneath footing bearing elevations and slabs-on-grades to depths recommended by the Civil and/or Structural Engineer and replace with properly placed and compacted fill materials.
- F. Extend excavations and fill soils laterally beyond footing and slab edges in accordance with recommendations of the Civil and/or Structural Engineer.
- G. Pavement Preparation: Prepare existing soils beneath slabs-on-grade and pavements in accordance with recommendations of the Civil and/or Structural Engineer.
- H. Existing Utilities:
 - 1. Identify known below grade utilities. Stake and flag locations.
 - 2. Identify and flag above grade utilities.
 - 3. Maintain, re-route, extend and protect as required existing utilities remaining which pass through Work area as indicated.
 - 4. Notify utility company to remove and relocate utilities obstructing the Work.
 - 5. Pay costs for this Work, except that covered by utility company.
- I. Unknown Utilities and Concealed Conditions:
 - 1. Upon discovery of unknown utility or concealed conditions which are unrecorded on the Contract Documents, discontinue affected Work and notify Architect in writing.
 - 2. Should additional work be required to remove, maintain, re-route, extend or protect unknown utilities or other conditions, the Contractor will be paid for the Work in accordance with the provisions of the General Conditions.

3.02 SUBGRADE

- A. Prepare subgrade at building areas to proper elevation to receive under-slab fill.
- B. Prepare subgrade at paved areas to proper elevation to receive base course materials. See Section 32 12 16.
- C. Grade as required to bring entire remainder of site to finished grade as indicated on drawings.

3.03 EXCAVATION - GENERAL

- A. Excavate for foundations and footings to provide vertical walls and corners square. Keep entire excavation free from loose material. Conform to dimensions and elevations indicated with allowances for erection of forms, shoring, waterproofing, and inspection of footings.
- B. Material to be excavated shall be non-classified and shall include earth or other materials encountered in excavating.
- C. The use of explosives will not be permitted.

- D. Drawings show predetermined elevations or depths for bottoms of footings. Should additional depth of excavation be necessary, the Contractor will be paid for the Work in accordance with the provisions of the General Conditions.
- E. Shore and brace excavations if necessary to prevent cave-ins. Remove shoring before backfilling is completed, but not until permanent supports are in place.
- F. If excavation is carried below depth indicated, backfill with properly placed and compacted fill material (material as specified) over properly prepared subgrade, or increase foundation depth as required without extra compensation.
- G. Remove excess excavated material from the grounds and legally dispose of same.
- H. Protect utility services uncovered by excavation.
 - 1. Remove abandoned utility service lines from areas of excavation; cap, plug or seal such lines and identify at grade.
 - 2. Accurately locate and record abandoned and active utility lines rerouted or extended, on Project Record Documents.

3.04 EXCAVATION - UTILITIES

- A. Trenching:
 - 1. General:
 - a. Perform trenching required for the installation of items where the trenching is not specifically described in other Sections of these Specifications.
 - b. Excavate for underground utilities, including water, steam, condensate, natural gas pipe lines, fire protection lines, sewers, electrical lines, cables, ducts and other electrical items.
 - 2. Width:
 - a. Make trenches open vertical construction with sufficient width to provide free working space at both sides of the trench and around the installed item as required for caulking, joining, backfilling, and compacting.
 - b. Provide for a minimum net clearance of 6 inches and a maximum net clearance of 12 inches on each side of the barrel of the pipe and to allow the backfill to be placed and properly compacted. Exceptions to these clearances will occur at encasement or special construction.
 - 3. Depth:
 - a. Trench as required to provide the elevations shown on the Drawings.
 - b. Where elevations are not shown on the Drawings or specified in other sections of the specifications, trench to sufficient depth to give a minimum of 18" of fill above the top of the pipe, measured from the adjacent finished grade.
 - c. Where the bottom of excavation is found to be soft and cannot support the pipe, the depth shall be extended until solid bearing is reached. Backfill to pipe foundation grade with granular material or earthfill and thoroughly compact to assure a firm foundation for the pipe.
 - d. Where excavation is in rock, or caliche, cut to depth of at least 8 inches below pipe invert elevations.
 - 4. Trench Bottoms:
 - a. Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit.
 - b. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
 - c. Remove stones and sharp objects to avoid point loading.

- d. For pipes or conduit less than 6 inches in nominal diameter and flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
 - e. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.
 - 5. Do not disturb any portion of or remove support from a piping system that has thrust blocks or other constraints against movement while the system is in service.
 - 6. Correction of faulty grades: Where trench excavation is inadvertently carried below proper elevations, backfill with pipe bedding material and compact to provide a firm and unyielding subgrade or foundation without additional compensation.
 - 7. Trench bracing:
 - a. Properly brace and support trenches in accordance with requirements of governing authorities.
 - b. Brace, sheet, and support trench walls in such a manner that the ground alongside the excavation will not slide or settle, and that existing improvements of every kind, whether on public or private property, will be protected from damage.
 - c. Arrange bracing, sheeting, and shoring so as not to place stress on portions of the completed Work until the general construction thereof has proceeded far enough to provide sufficient strength.
 - 8. Repairs and replacement: In the event of damage to such improvements, immediately make repairs and replacements necessary to the approval of the Architect without additional compensation.
 - 9. Removal of trench bracing: Exercise care in the drawing and removal of sheeting, shoring, bracing, and timbering to prevent collapse and caving of the excavation faces being supported.
 - 10. Grading and stockpiling trenched material: Control the stockpiling of trenched material in a manner to prevent water running into the excavations. Do not obstruct surface drainage, but provide means whereby storm water is diverted into existing gutters, other surface drains, or temporary drains.
- B. Crossing Protection
- 1. Provide adequate temporary crossover for pedestrian and vehicular traffic including guard rails, lamps and flags, as required by agencies having jurisdiction and as directed.
 - 2. Remove provisions for crossing protection when they are no longer needed.
- C. Underpinning: Where excavation work is required under or adjacent to existing footings, under-pin as required to prevent damaging existing construction.

3.05 FOUNDATION FOR PIPES

- A. General: Grade the trench bottoms to provide a smooth, firm, and stable foundation free from rockpoints throughout the length of the pipe.
- B. Foundation material: Place a minimum of 6" of the specified pipe bedding fill material in the bottom of the trench.
- C. Subsurface conditions: In areas where soft, unstable materials are encountered at the surface upon which cohesionless material is to be placed, remove the unstable material and replace it with material approved by the Architect. Make sufficient depth to develop a firm foundation for the item being installed.

- D. Overexcavation: If the need for such overexcavation has been occasioned by an act or failure to act on the part of the Contractor, make the overexcavation and replacement without additional compensation.
- E. Bearing: At each joint in pipe, recess the bottom of the trench as required into the firm foundation in such a manner as to relieve the bell of the pipe of all load and to ensure continuous bearing of the pipe barrel on the firm foundation.
- F. Shaping: Accurately shape pipe subgrade and fit the bottom of the trench to the pipe shape. Use a drag template shaped to conform to the outer surface of the pipe if other methods do not produce satisfactory results.

3.06 BEDDING FOR PIPES

- A. General: Place the specified pipe bedding fill material in the trench, simultaneously on each side of the pipe for the full width of the trench, to a maximum depth of 3 feet and a minimum depth of one foot above the outside diameter of the pipe barrel. Water consolidation shall not be allowed
- B. Densification: Take special care to provide firm bedding support on the underside of the pipe and fittings for the full length of the pipe.
- C. Alternate bedding: Other bedding procedures and materials may be used if prior written approval has been obtained from the Civil Engineer through the Architect.

3.07 UNDER-SLAB FILL

- A. Place under-slab fill to the thickness and grade indicated, smooth and even, free of voids. Compact to specified density. Grade to a tolerance of 1/4 inch in 10 feet.

3.08 BACKFILLING - GENERAL

- A. After completion of the foundations, walls and other construction, and removal of forms, clean the excavations of trash and debris.
- B. Place the backfill symmetrically against each side of the walls to prevent eccentric loading. Place backfill in horizontal 6 inch (150mm) layers with the proper moisture content for the required degree of compaction.

3.09 BACKFILLING - UTILITIES

- A. Backfill pipe and conduit trenches in a manner to prevent disturbance to the pipes or conduits. Fill under and around pipes thoroughly to a point approximately 12 inches above the top of the pipe and compact. Backfill remainder of trench in 6 inch layers and compact.
- B. Backfill utility trenches in accordance with MAG Section 601
 - 1. Delete references to compaction methods specified in paragraph 6.01.2.5 and 6.01.4.4 of MAG Section 601 and insert the following:
 - a. The compacted density of the trench backfill shall be 95% of ASTM D-1557 (Method A or D) with the percent of density adjusted to compensate for the rock content larger than that which will pass a #4 sieve, by the method provided in the City of Phoenix Chart, Detail No. 35.
 - b. At least one density and moisture content test shall be taken in per 500 lineal feet of trench backfill per layer of backfill. The test must be made prior to any additional formation of backfill

2. Revise paragraph 6.01.4.3, Backfill, as follows: "All backfill shall be granular material. Water settling is not permitted. Backfill for electrical direct burial or concrete encased duct in paved areas under roadway shoulder shall be wet sand slurry.
- C. Backfilling prior to approvals: Do not allow or cause portions of the work performed or installed to be covered up or enclosed by work of this Section prior to required inspections. Should any of the work be so enclosed or covered up before it has been inspected, uncover such work at no additional compensation.
- D. Backfill simultaneously on both sides of utility to prevent displacement.
- E. Concrete backfill trenches that carry below or pass under footings and that are excavated within 18 inches of footings. Place concrete to level of bottom of footings.
- F. Provide 4-inch-thick concrete base slab support for piping or conduit less than 2'-6" below surface of roadways. After installation and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase.
- G. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.10 COMPACTION

- A. Place and compact fills to 90 percent compaction minimum in accordance with recommendations of the Civil and/or Structural Engineer.
- B. Utilize mechanical compaction equipment in grading operations. In no case shall water settling or "jetting" be employed. Vibratory compaction equipment employed shall be subject to the approval of the Architect to ensure that vibrations will not be created that will affect existing construction or slopes.

3.11 FINISH GRADING

- A. After construction and final clean-up of exterior, and removal of debris, grade building site to slopes and elevations directed.
- B. Leave graded areas raked smooth.
- C. Remove excess material from the site.

3.12 FIELD QUALITY CONTROL

- A. Earthwork, footings depths, and excavations for foundations shall be inspected by the Geotechnical Engineer to verify allowable soil bearing and low settlement and swell potential, and to make any additional recommendations.
- B. Tests: Inspection and testing of earthwork shall be performed by a testing laboratory in accordance with Section 01 45 00.
 1. Provide free access to Work and cooperate with appointed firm.
 2. Tests of materials may be performed to ensure conformance with specified requirements.
 3. Provide one field density test of under-slab fill for every 2,000 square feet of building area.
 4. Provide two field density tests of backfill at locations and elevations directed.

5. Provide one field density test of prepared subgrade for every 2,000 square feet of site and building area.
6. Soil compaction which does not meet the specified requirements shall be recompact and reworked as directed by the Geotechnical Engineer through the Architect.

3.13 PROTECTION

- A. Protect newly graded areas from traffic and erosion, keep areas free of trash and debris. Repair and establish grades in any areas settled, rutted or eroded.

END OF SECTION

SECTION 31 31 00

SOIL TREATMENT

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Pretreatment to provide chemical barrier to protect buildings and contents against attack by subterranean termites.
 - 2. Treatment of site and areas as indicated to remove vegetation growth.

1.02 SUBMITTALS

- A. Product Data: Submit label indicating Manufacturer's chemical analysis of treatment materials prior to application. Submit evidence of EPA approval and State registration.
- B. Test Reports: Submit reports of field tests for termite treatment.

1.03 QUALITY ASSURANCE

- A. Applicator Qualifications: Registered applicator with 5 years experience and licensed by the Arizona Structural Pest Control Commission.
- B. Regulatory Requirements: Chemicals shall be approved for use and registered by Environmental Protection Agency (EPA) and the Arizona Structural Pest Control Commission.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Conform to Manufacturer's instructions and Governmental Agencies' requirements.
- B. Deliver materials to Project in original sealed and labeled containers of Manufacturer.

1.05 SITE CONDITIONS

- A. Do not apply chemicals in inclement weather or when there is a possibility of rain.

1.06 WARRANTY

- A. Upon completion of soil treatment, and as a condition of final acceptance, provide Owner with written unlimited warranty providing:
 - 1. Application was made at concentration, rate, and method in compliance with Specifications contained herein.
 - 2. Warrants effectiveness of the soil treatment against subterranean termite infestation for a period of not less than 5 years from acceptance and completion date of Project.
 - 3. Warrants effectiveness of soil treatment against vegetation growth for a period of six (6) months.

- B. Upon evidence of subterranean termite activity within warranty period, re-treat area to stop infestation of affected areas and repair termite caused damage to building at no cost to Owner.
 - 1. Re-treatment under warranty sufficient to prevent termites from attacking building or its contents during remainder of initial warranty period, plus one additional year for each time re-treatment under warranty is required.
 - 2. Complete re-treatment of the building shall be as specified herein and shall be rendered upon the third recurrence of subterranean termites in the same structure within 5-year period from the date of project acceptance.
 - 3. Damage caused by infestations and by re-treatment shall be repaired at no cost to the Owner.
- C. Upon evidence of vegetation growth re-treat area at no cost to Owner.
- D. Draft warranty in favor of Owner, successors or assigns.
 - 1. Pre-printed FHA or VA guarantee forms shall not be acceptable.
 - 2. The Owner and the applicator reserve the option to renew termite protection on an annual basis after the expiration of the warranty.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Termite Treatment: Apply one of the following chemicals as a water emulsion (no oil solutions permitted):
 - 1. Dragnet SFR (Permethrin), FMC Corporation www.fmc.com
 - 2. Prelude (Permethrin); Syngenta www.syngentaprofessionalproducts.com
 - 3. Prevail FT (Cypermethrin); FMC Corporation www.fmc.com
 - 4. Talstar (Bifenthrin), FMC Corporation. www.fmc.com
 - 5. Premise (Imidacloprid); Bayer Environmental Science www.bayerprocentral.com , www.nobugs.com
 - 6. Demon TC or Demon Max (Cypermethrin) Syngenta www.syngentaprofessionalproducts.com
 - 7. Termidor (Fipronil), Termidor Termite Control; BASF - www.termidorhome.com.
- B. Vegetation Treatment:
 - 1. Pre-Emergent:
 - a. Oryzalin (Surflan).
 - 2. Post-Emergent:
 - a. Roundup; Monsanto www.roundup.com
 - b. Season Long or Ground Clear; ORTHO www.ortho.com
 - c. SeasonPlus Grass and Weed Killer Plus Preventer; Spectracide www.spectracide.com
- C. Mix solutions in accordance with Manufacturer's directions to highest concentration allowable by label.

PART 3 EXECUTION

3.01 APPLICATION - TERMITE CONTROL

- A. Time of Application:
 - 1. Notify Architect to be present during application, at least 24 hours prior to application of materials.
 - 2. Apply chemical treatment during normal working hours in order to be subject to observation.
 - 3. Do not treat soil and fill areas that are excessively wet or after heavy rains to avoid surface flow of toxicants.
- B. Application: In accordance with Manufacturer's recommendations, and local codes and regulations.
 - 1. Provide applicator trucks with approved measuring flow meters.
 - 2. Apply chemicals on soils and compacted ABC fill materials under entire subsurfaces of concrete floor slabs and slabs abutting building walls in quantities and locations stated on label.
- C. Do not disturb aggregate base course and treated soil between application of poison and pouring of concrete.
 - 1. Re-treat soil or compacted fill which has been disturbed after soil poisoning, due to plumbing and electrical changes or omissions.
 - 2. Should rainy weather occur prior to pouring concrete slab over treated ABC, re-treat the complete area at the discretion of Architect, and at no additional cost to Owner.

3.02 APPLICATION - VEGETATION CONTROL

- A. Apply chemical to on-site landscape areas and landscaped portions of public street right-of-ways of site.
- B. Chemical Control: Prior to planting operations, provide 2 applications over unwanted vegetation.
- C. Pre-emergent: Post landscape planting operations. Comply with manufacturers label for application and protection of existing landscape planting.

3.03 FIELD QUALITY CONTROL

- A. Tests: Chemical analysis tests shall be made of materials used on the basis of one test for each 10,000 square feet of treated area. Samples and test may be taken of both concentrates and the dilute materials as being applied. See Section 01 45 00 for provisions covering payment for testing.

3.04 PROTECTION

- A. Adjacent property, trees and plants shall be protected from injury and damage as result of operations in this Section.

END OF SECTION

SECTION 32 12 16

CUTTING AND PATCHING OF ASPHALTIC PAVING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes cutting and patching of existing asphaltic concrete paving as necessary for demolition, new construction and capping of utilities.

1.02 SUBMITTALS

- A. Design Mix: Submit design mix-formula for asphalt concrete not less than 7 days in advance of actual placement of material.
- B. Certificates: Submit Certificate of Compliance indicating that materials to be incorporated in Work meet Specification requirements.

1.03 QUALITY ASSURANCE

- A. Comply with Maricopa Association of Governments (MAG) Specifications except as specified otherwise.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Transport bituminous mixtures to site in clean trucks and in manner to prevent segregation of materials or inclusion of foreign substances.
- B. Mix to consist of specified aggregate and bitumen.
- C. Asphalt surface course mixture to have minimum temperature of 285 degrees F. and maximum temperature of 350 degrees F.

1.05 SITE CONDITIONS

- A. Environmental Requirements:
 - 1. Conform to applicable requirements of MAG Section 321.
 - 2. Place asphaltic concrete when surface is dry, when the ambient temperature in shade is 40 degrees F. and rising, or above 50 degrees F. if falling.
 - 3. Do not place asphaltic concrete when weather is foggy, rainy, or when base on which material is to be placed is wet or frozen.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Aggregate Base Course:
 - 1. Base materials: Conform to MAG Sections 310 and 702 and requirements specified herein. Material to be crushed rock product with a plasticity index not exceeding 5 and comply with grading requirements shown in Table 702.
 - 2. Aggregate: Clean and free of organic matter and of such a nature that it can be compacted to a dense and firm layer capable of supporting loaded trucks and self-propelled pavers without rutting.

3. Deliver aggregate to site in thoroughly blended condition and handle in manner to prevent excessive segregation. Do not mix underlying soil or subbase with aggregate base material. Do not mix underlying soil or subbase with aggregate base material.
- B. Tack Coat: Mixing type emulsion SS-I-H, as specified in MAG Section 713, diluted in proportion of approximately 50 percent water and 50 percent emulsion. See MAG Section 321.
- C. Asphaltic Concrete Paving:
 1. Refer to MAG Section 710.
 2. Asphalt concrete shall be Type 12.5mm or 19mm single course mix as indicated on Drawings or as required to match existing. Percentage asphalt range: 5.0 to 6.0.
 3. When test procedures determine aggregate is subject to stripping, add dry hydrated lime conforming to requirements of ASTM C207, Type N; portland cement conforming to Section 725 of MAG Specifications; or other approved anti-strip agent.
- D. Composition and Grading: Comply with MAG Section 710.3. Aggregates and mix to be incorporated into Work shall show loss in L.A. Rattler (ASTM C131) (after 500 revolutions) of 40% max.

2.02 EQUIPMENT

- A. Spreading and Finishing Equipment: Comply with MAG Section 321.5.2.
 1. Equipment to be of good condition and capable of performing Work specified in satisfactory manner.
 2. Start finish rolling after pavement has cooled sufficiently to permit removal of roller marks and continue in whatever direction is necessary to produce a pavement surface free of indentations. See MAG Section 321.
 3. Leveling Course: Comply with MAG Section 321.5.3.

2.03 MIXES

- A. Job-mix formula shall indicate percentage passing for each specified sieve size of mineral aggregate and percent of asphalt to be used for each asphalt concrete mixture to be incorporated on Project. Job-mix formula (gradation), with allowable tolerances for a single test, to be used for job control. Single test variation tolerance is shown in following table. In no event shall less than 2 percent of mineral aggregate pass a No. 200 sieve.
 1. No. 4 and larger : ± 7
 2. No. 30: ± 5
 3. No. 200: ± 2
 4. Asphalt, percent by weight of mix: ± 4

PART 3 EXECUTION

3.01 PREPARATION

- A. Base Preparation: Comply with MAG Section 321.5.1, and as required to match existing being patched.

3.02 CUTTING AND PATCHING OF ASPHALT CONCRETE PAVING

- A. Cut existing asphalt pavement back a minimum of 12 inches into stable, sound pavement material with stable, undisturbed bases.
 - 1. Remove and recompact existing subgrades and/or base course materials necessarily disturbed, that are loose, or un-bound.
 - 2. Saw-cut existing asphalt vertically to full depth.
 - 3. Saw-cut and remove areas in square, rectangular or trapezoidal shapes. Do not leave irregular or fractured faces of any size.
- B. At patched areas, provide aggregate base course materials to match existing depth and tie into existing. Compact level to existing.

3.03 APPLICATION

- A. Base Course:
 - 1. Construct aggregate base course on subgrade and compact to a minimum of 95 percent of maximum density in accordance with ASTM D1557.
 - 2. Thickness: Place base course materials in minimum compacted thickness indicated on Drawings or as necessary to match and tie into existing.
- B. Tack Coat:
 - 1. Apply tack coat to vertical surfaces of existing pavement, curbs, gutters and construction joints, against which additional material is to be placed, to a new or old pavement to be overlaid, and to other surfaces as designated by Architect.
 - 2. Tack coat to be slow setting type emulsion as specified. If emulsion is applied undiluted, apply at rate of 0.02 to 0.10 gallons per square yard; if emulsion is applied diluted 1:1 with water, apply at rate of 0.05 to 0.10 gallons per square yard, as directed by Architect.
 - 3. Clean surfaces of loose and foreign material prior to application of tack coats.
- C. Asphaltic Concrete:
 - 1. Construct asphalt pavement in accordance with applicable requirements of MAG Section 321.
 - 2. Thickness: Place asphalt concrete in minimum compacted thickness indicated on Drawings or as necessary to match and tie into existing.
 - 3. If pavement is constructed in lifts using an asphalt concrete base in the first lifts, base to be thoroughly cleaned by whatever means necessary prior to application of tack coat and placement of surface layer.
- D. Compaction: Comply with requirements of MAG Section 321.5.4.
 - 1. Compact asphalt concrete surfacing to a density of 95 percent of 75 blows (ASTM D6926).
 - 2. Measure asphalt density by means of a nuclear density gauge, or core testing. Nuclear gauge method will be preferred.
- E. Upon completion, pavement surface to be smooth, dense and of uniform texture and appearance.
 - 1. All areas to properly drain and be free of standing water.
- F. Tolerances:
 - 1. Thickness: Compacted thickness shall be within the following tolerances from thickness indicated.
 - a. Base Course: Plus or minus 1/2 inch .
 - b. Surface Course: Plus or minus 1/4 inch .

2. Surface Smoothness:
 - a. Base Course: Plus or minus 1/2 inch, measured using a 10 foot straight-edge placed in any position on finished surface, except across flow lines.
 - b. Asphalt Concrete Surface Finish: Minus 1/4 inch from the lower edge of a 25 foot straight-edge laid on the finished surface of the asphalt and parallel with the center line of the road or drive.
 - c. Asphalt Concrete Crowned Surface Finish: Plus or minus 1/4 inch, measured with a crowned template.
- G. Corrective Requirements for Deficiencies: Comply with MAG Section 321.6.
- H. Paving Termination:
 1. Provide thickened edge at paving terminations that do not have wood header forms or concrete curbs.
 2. Pavement termination to be minimum 12 inches wide x 8 inches deep or as shown on Drawings.

3.04 FIELD QUALITY CONTROL

- A. Smoothness Tests:
 1. Test conformance of crown and grade of pavement as indicated. Finished surface to be smooth and finished within specified tolerances.
 2. Immediately after initial rolling, correct variations by adding or removing material as required. Cut out and replace any spots deficient in thickness with fresh mixture which is properly bonded to existing pavement.
 3. After final rolling, retest surface and correct irregularities in excess of specified tolerance by removing defective Work and replacing with new material.

END OF SECTION

SECTION 32 16 00

CONCRETE CURBS, GUTTERS, SIDEWALKS AND DRIVEWAYS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Concrete curbs, gutters, sidewalks and driveways as shown on the Drawings, including cutting and patching of existing concrete curbs, gutters, walks and driveways where removed or modified to accommodate new construction..

1.02 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with applicable Federal, State and local ordinances, including MAG Specifications Where geotechnical report, General Structural Notes, or notes on drawings state more restrictive requirements, the requirements of the geotechnical report, General Structural Notes, or notes on drawings shall govern.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Concrete for Curbs, Gutters, Sidewalks, and Sidewalk Ramps: Class B, complying with applicable requirements of MAG Section 725.
- B. Concrete for Drives: Comply with Section 1006 of the ADOT Standard Specifications and recommendations of the Report on Geotechnical Investigation.
- C. Expansion Joint Filler: MAG Section 729.
- D. Epoxy Resin: Sta-Crete Epoxy Resin No. 15-J or 20.
- E. Curing Compound: ASTM C309, Type 1, Class B; acrylic type.
- F. Traffic Joint Sealant: As specified in Section 07 92 00.
- G. Concrete Sealer: As specified in Section 03 30 00.

PART 3 EXECUTION

3.01 PREPARATION

- A. Cut existing pavements and concrete joined by new construction in accordance with MAG Sections 336 and 350. Saw-cut and remove existing concrete at stable undisturbed material to remain or extend removal to construction joint.
 - 1. Do not disturb existing base course materials at concrete to remain.
 - 2. Remove and recompact existing subgrades and/or base course materials necessarily disturbed, that are loose, or un-bound.
 - 3. Saw-cut existing concrete vertically to full depth.

4. Saw-cut and remove areas in square, rectangular or trapezoidal shapes. Do not leave irregular or fractured faces of any size.
 5. Remove existing walks and/or drives as indicated or as necessary to tie into and match finished elevations of new Work.
- B. Construct subgrade and compact true to grades and lines shown on Drawings and as specified in MAG Section 301.
- C. Do not disturb previously prepared subgrades and subbase course. Where loose soils are encountered beneath pavements, scarify, moisture condition and properly recompact soils in compliance with Section 32 01 00.
- D. Material displaced during construction shall not be placed on base or surfacing material already in place on roadway. Do not place excavated material in manner as to interfere with access to property or traffic flow in street.
- E. Remove existing walks and/or drives as indicated and as required to tie into and match finished elevations of new Work.

3.02 CONCRETE CONSTRUCTION

- A. Construct concrete curbs, gutters and sidewalks by conventional use of forms, or by means of a curb and gutter machine when approved by Architect.
1. If machines designed specifically for such work and approved by the Architect are used, results must be equal to or better than that produced by use of forms.
 2. If the results are not satisfactory to Architect, discontinue use.
 3. Requirements applicable to use of forms shall apply to use of machines.
- B. Extruded Concrete Curbs Without Gutter: Provide extruded concrete formed-in-place curbs to cross section and locations as shown on Drawings and as specified.
- C. Concrete for Curbs, Gutters and Sidewalks: 40 percent stone by weight and extruded in a zero slump condition.
- D. Jointing: Finish all joint fillers in continuous one-piece lengths.
1. Construct expansion and control joints vertical, and at right angles to centerline of drive and match joints in adjacent pavement or sidewalks.
 2. Concrete drives: Provide expansion joints at maximum 15 feet o.c., unless otherwise indicated on Drawings.
 3. Curbs, Gutters and Walks: Provide expansion joints at maximum 20 feet o.c., unless otherwise indicated on Drawings.
 4. Provide construction joints at all side and end terminations.
 5. Provide isolation joints at all areas abutting curbs, catch basins, manholes and similar civil structures, walks, buildings, and other fixed objects.
 6. Construct expansion joints at radius points, driveways, alley entrances and at adjoining structures.
 7. Construct contraction joints as detailed.
 8. Fill expansion and contraction joints with traffic joint sealant as specified in Section 07 92 00.
- E. Bonding:
1. Bond extruded concrete curbing to asphalt surfacing by use of SS-1-H or CSS-1-H cutback asphalt tack coat conforming to requirements of MAG Section 713.
 2. Apply tack coat in a manner approved by Architect to provide a uniform continuous coating 1/8 to 3/16 inch in thickness and a width one inch less than the base width of curbing.

3. Take care to prevent spills or running of tack coat over surface of finished asphalt pavement.
 4. Bond extruded concrete curbing to concrete surfaces by use of an epoxy resin.
- F. Forms:
1. Carefully set forms to line and grade, securely staked in position and conforming to dimensions of curbs, gutters, sidewalks, driveways and alley intersections.
 2. Moisten forms and subgrade immediately in advance of placing concrete.
 3. Clean forms thoroughly each time they are used, and coated with a light oil, or other releasing agent of a type which will not discolor concrete.
 4. Thoroughly spade concrete away from forms so that there will be no rock pockets next to forms.
 5. Concrete may be compacted by mechanical vibrators approved by Architect.
 6. Continue tamping or vibrating until mortar flushes to surface, and coarse aggregate is below concrete surface.
- G. Shape edges with tool formed to round edges to radius indicated on standard details.
- H. Form Removal:
1. Do not remove front face form before concrete has taken initial set and has sufficient strength to carry its own weight.
 2. Do not remove gutter forms and rear forms until concrete has hardened sufficiently to prevent damage to the edges.
 3. Take special care to prevent damage.
 4. Repair any portion of concrete damaged while stripping forms. If damage is severe, replace at no additional cost to Owner.
- I. Finishing and Curing:
1. Comply with MAG Section 505 and Specifications Section 03 30 00 for finishes and as indicated on Drawings. Finishes shall be as follows:
 - a. Exterior Walks: Medium broom finish.
 - b. Drives: Heavy broom finish.
 2. Take care in extruding radiuses and corners to prevent cracking and breaking of concrete curbing.
 3. Finish extruded curbs immediately after placing to achieve a surface comparable to a uniform broom finish.
 4. Spray extruded curbs with curing agent sealer immediately after placing.
 5. Thoroughly fill, bond, and finish breaks or cracks to match remaining installation in manner approved by Architect.
 6. Curbing found unacceptable by Architect to be replaced at Contractor's expense.
- J. Concrete Sealer: All exposed flatwork concrete, including curbs, gutters, walks and drives, shall be sealed with 2 coats of sealer.
1. Surface must be clean, dry and free of loose dirt, oil, wax, curing and parting compounds and other foreign matter.
 2. Apply each coat in accordance with Manufacturer's printed instructions.
- K. Backfilling: Unless otherwise specified, backfill behind curbs or sidewalk with native soil to lines and grades shown on Drawings.

3.03 FIELD QUALITY CONTROL

- A. Testing:
1. Test face, top, back and flow line of curb and gutter with a 10 foot straightedge or curved template, longitudinally along surface.
 2. Correct deviations in excess of 1/4 inch.

3. Test surface of concrete sidewalks with a 5 foot straight edge. Correct deviations in excess of 1/8 inch.
4. Gutters:
 - a. When required by Architect, water test gutters having a slope of 0.8 foot per 100 feet or less, and where unusual or special conditions indicate gutter may not drain satisfactorily.
 - b. Water testing consists of establishing flow in length of gutter to be tested by supplying water from a hydrant, tank truck or other source.
 - c. One hour after supply of water is shut off, inspect gutter for evidence of ponding or improper shape.
 - d. In the event water is found ponded in gutter to a depth greater than 1/2 inch, or on the adjacent pavement, correct defect or defects in a manner acceptable to Architect.
5. Remove and replace sections of Work deficient in depth or not conforming to Drawings or Specifications.

END OF SECTION

SECTION 32 17 26

DETECTABLE/TACTILE WARNING SURFACES

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Detectable/Tactile warning surface panels where indicated on the Drawings.

1.02 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Material test reports from independent testing laboratory indicating that the material proposed for use meets the physical properties indicated herein.
 - 2. Preparation instructions and recommendations.
 - 3. Storage and handling requirements and recommendations.
 - 4. Installation methods.
 - 5. Maintenance instructions for tactile warning panels as required.
- B. Samples for Verification Purposes: Submit three (3) panel samples minimum 4"x4" of the kind proposed for use, showing color, finish and texture.
- C. Shop Drawings: Show fabrication details, composite structural system, panel surface profile, fastener locations, plans of panel placement including joints, and material to be used as well as outlining installation materials and procedure.
- D. Maintenance Instructions: Submit copies of manufacturer's specified installation and maintenance practices for each type of detectable warning surface panel and accessory as required.

1.03 QUALITY ASSURANCE

- A. Provide Detectable/Tactile Warning Surface Panels and accessories as produced by a single manufacturer regularly engaged in the manufacturing of products of the type specified.
- B. Installer's Qualifications: Engage an experienced Installer approved by panel manufacturer as qualified for installation, who has successfully completed installations similar in material, design, and extent to that indicated for Project.
- C. Americans with Disabilities Act (ADA): Provide Detectable/Tactile Warning Surface Panels which comply with the detectable warnings on walking surfaces section of the Americans with Disabilities Act (Title III Regulations, 28 CFR Part 36 ADA STANDARDS FOR ACCESSIBLE DESIGN, Appendix A, Section 4.29.2 DETECTABLE WARNINGS ON WALKING SURFACES).

1.04 DELIVERY, STORAGE AND HANDLING

- A. Package or crate materials suitably to prevent damage in shipment or handling. Finished surfaces shall be protected by sturdy wrappings and panel type shall be identified by part number.
- B. Deliver materials to location at building site for storage prior to installation.

1.05 SITE CONDITIONS

- A. Environmental Conditions and Protection: Maintain minimum temperature of 40 deg. F in areas to receive panels for at least 24 hours prior to installation, during installation, and for not less than 24 hours after installation.

1.06 GUARANTEE

- A. Panels shall be guaranteed in writing for a period of five (5) years from date of substantial completion. Guarantee shall include defective work, breakage, deformation, fading and loosening of panels.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. Acceptable Manufacturer: Masons Supply Co., Portland, OR www.masco.net

2.02 PANELS

- A. Product: CASTinTACT as manufactured by Mason's Supply Corporation.
 - 1. High strength cementitious concrete panels - enhanced with microsilica - 3 dimensionally reinforced with structural fibrillating monofilament fibers.
 - 2. Size: As indicated or as required by layout on drawings.
 - 3. Color: As selected by Architect
 - 4. Dome Design:
 - a. Dome Base: 0.9 inch to 1.4 inches.
 - b. Dome Top: 50 to 65 percent of the base diameter.
 - c. Dome Height: 0.2 inch.
 - d. Dome Spacing: 1.6 inches minimum to 2.4 inches maximum.
 - e. Base to Base Spacing: 0.65 inch.
- B. Physical Properties:
 - 1. Cementitious Concrete Panels shall have an average compressive strength of 10,000 psi. (ASTM C140).
 - 2. Flexural Strength (ASTM C293): 1,100 psi average.
 - 3. Water Absorption (ASTM C140): Less than 5 percent average.
 - 4. Freeze Thaw Durability (ASTM C1262): (100 cycles), 3 percent NaCl, less than 1 percent.
 - 5. Freeze Thaw Durability (ASTM C1645): (25 cycles), 3 percent Saline Solution, Passed.
 - 6. Scaling Resistance (ASTM C672): (50 cycles), 0 - 1.
 - 7. Abrasion Resistance (ASTM C779): (1 hour), < .02 inch.
 - 8. Slip Resistance (ASTM C1028): Modified > .8 wet or dry.
- C. Accessories: Provide accessories and appurtenances as supplied or recommended by the manufacturer, including grout mix, templates and other devices for installation of panels as indicated and as necessary to comply with regulations.

PART 3 EXECUTION

3.01 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.
- C. Expansion joints and control joints shall be located in compliance with ACI recommendations. Joint materials shall follow manufacturer's directions and instructions.

3.02 INSTALLATION

- A. Temperature affects the setting time and rate of strength of concrete, standard ACI procedures for storing, mixing, and placing concrete in hot or cold weather shall be followed. Refer to ACI 305 "Standards on Hot Weather Concreting," and ACI 306 "Standard on Cold Weather Concreting."
- B. Thickness of concrete under panels shall be increased 1 inch in depth. Prepare a well drained and properly compacted subgrade. Leave no puddles, standing water, ice, frost, or mud. Consult Contract Documents for information on subgrade and compaction details.
- C. Provide expansion and control joint width indicated in drawings. Joint materials used shall follow manufacturer's directions and instructions.
 - 1. Expansion joints shall be carried through all layers of installation materials including tactile warning panels, concrete substrate and steel reinforcing. Joints shall be spaced 8 feet to 12 feet on center in both directions. Perimeter edges of ramps or blended transitions shall have expansion joints. (Refer to ACI 360R guidelines for details on placement, size and specifications of material).

3.03 CAST-IN-PLACE INSTALLATION:

- A. Position forms for proper grade, slopes and uniform slab thickness. Refer to Contract Drawings for details on reinforcement and joint placement.
- B. Block Out/Full Depth Retrofit Installation
 - 1. Saw cut existing concrete full depth using a diamond blade. Oversize area a minimum 2 inches in each direction of warning panel layout. Contain slurry and dispose of properly. Partial depth cutting and breakout will not be allowed. Do not chip the concrete on perimeter of cut out. The perimeter chips and over cuts shall be filled and patched with a gray epoxy gel adhesive approve by manufacturer.
 - 2. Dowel into existing concrete as required.
- C. Concrete shall conform to Contract Documents with a maximum slump of 4 inches. Concrete shall be placed and finished to the proper grade and slope prior to tactile warning panel placement.
 - 1. Recess panel below finish grade with manufacturer's INSTALaTACT tool before initial concrete set and finish concrete supporting slab with wood float to leave an open surface.
 - 2. Concrete shall be poured, floated and recessed 7/8 inch below finish grade to proper grade and slope.

- D. Pre-Dampen back of tactile warning panels with potable water. At Contractor's option apply one of the following.
 - 1. Apply 1/8 inch thickness of manufacturer's Wet Set PreMix (3:1 ratio of powder to potable water).
 - 2. Apply 1/8 inch thickness of (1:1:1/2 ratio of Portland cement, clean masons sand and potable water).
 - 3. Apply 1/8 inch thickness of fresh concrete removed from the INSTALaTACT tool.
 - 4. Work into textured surface on back of panel with rubber float for 100 percent surface coverage.
- E. Install tactile warning panels immediately in fresh concrete and lightly tap panels to grade using a rubber mallet to insure bond and 100 percent surface contact. Wedge or flared edge of panel facing the curb and square edges of panel joints butted together. Base of truncated dome shall be flush with adjacent surfaces to permit proper drainage and eliminate tripping hazard between surfaces. Tolerance between tactile panels and surrounding surfaces shall be 1/16 inch maximum. Immediately after placement re-check slope and elevation for proper grade.
 - 1. Leave a 3/16 inch gap between square cut panels joints and seal with a compatible elastomeric sealant conforming to ASTM C920. Follow sealant's manufacturer's recommendations for joint preparation and installation procedures. Protect from traffic until sealant has cured.
- F. Finish surrounding concrete flush with tactile panels. Edge around panels with 1/8 inch radius edger, install control joints and finish in accordance with project specifications.
- G. Concrete surrounding tactile panels shall be cured in accordance with Contract Documents and ACI 308. Protect panels while spraying curing compound.

3.04 CLEANING

- A. Remove all unused material, tools, and equipment. Dispose of properly.
- B. Clean the panels in accordance with the manufacturer's cleaning and maintenance guide.
- C. Clean fresh dried concrete residue off panels with a stainless steel wire brush and rinse with clean water and hydra sponge to ensure a clean appearance.

3.05 PROTECTION

- A. Protect installed products until completion of project.
- B. Protect the tactile warning panel surface from traffic until desired strength is achieved. If necessary, protect panels with plywood over an underlayment layer of non-staining, non-woven curing blanket until acceptance of work. Secure plywood if needed.
- C. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION