Fayette County GEORGIA

Where Quality Is A Lifestyle

November 9, 2010

PROPOSAL #P774

Gentlemen:

You are requested to submit a proposal for Fayette County Library Expansion Construction as per the specifications, and information contained herein. All required information shall be included with your proposal. Any exceptions to the specifications shall be listed in the space provided. An original and five (5) copies of your proposal should be submitted.

A pre-proposal conference will be held at 10:00 a.m. on Tuesday, November 23, 2010 at The Fayette County Library located at 1821 Heritage Park Way in Fayetteville, GA. for the above referenced request for proposal. All companies and interested parties are invited and strongly urged to attend. This will be the opportunity to voice all questions, concerns and comments about this request for proposal and have them addressed. It is important that you attend.

All questions and inquires concerning this request for proposals or the specifications shall be addressed to Trina C. Barwicks, Contract Administrator of Purchasing, 140 Stonewall Avenue West, Suite 101 in Fayetteville, Georgia 30214 from 8:00 a.m. to 5:00 p.m. The phone number is (770) 305-5420, Fax: (770) 719-5515 and/or Email Address: tbarwicks@fayettecountyga.gov. Deadline for all questions is 10:00a.m., November 19, 2010. **Any deviations from this procedure for questions or information pertaining to request for proposals may result in your proposal being rejected.**

Your proposal should be on the attached pricing sheet. All prices shall be F.O.B. Destination, Fayette County. Be sure to include the **proposal number** and **reference** along with your company's name and address on the **sealed** envelope in which the proposal is returned.

PROPOSAL MUST BE SUBMITTED TO:
FAYETTE COUNTY PURCHASING DEPARTMENT
140 STONEWALL AVENUE WEST, SUITE 101
FAYETTEVILLE, GEORGIA 30214
PROPOSAL **#P774**
REFERENCE: LIBRARY EXPANSION CONSTRUCTION

PROPOSAL #P774 November 9, 2010

Proposals will be received at the above address until 3:00 p.m. Tuesday, December 7, 2010 in the **Purchasing Department, Suite 101.** Proposals will be opened at approximately 3:00 p.m., December 7, 2010 and the names of the companies that responded will be read. Proposals must be signed to be considered. Late proposals will not be considered. Faxed proposals will not be considered.

If this request for proposal is downloaded from our web site, it is the responsibility of the individual or company that downloads this request for proposal to continue to check the Fayette County web site for any addenda that might come out for this request for proposal and are posted on the Fayette County web site. Fayette County shall not be responsible for any information that any individual or company fails to get in an addendum that is posted on the Fayette County web site but is not downloaded. However, if the Fayette County Purchasing Department mails the request for proposal to a company or individual, we will keep a record of who we mailed that request for proposal to and all addenda for that request for proposal will also be mailed to those companies or individuals.

****

The name of the companies that respond to this request for proposals will be posted on the Fayette County website within 3 business days after the proposal opening.

There is no set time for an award to be made, as the proposals have to be evaluated, some presentations may be required, and a recommendation has to be prepared and then scheduled to go before the Board of Commissioners for consideration by the Board. If an award is not made within 60 days of the proposal opening, an update will be posted on the Fayette County website.

If the Board awards this proposal, once everything has been received by that company and the award has been completed, that information will also be posted on the Fayette County website. Please keep this procedure in mind.

****

The County reserves the right to reject or accept any or all proposals and to waive technicalities, Informalities and minor irregularities in proposals received.

Sincerely,

Tim Jones, CPPO
Director of Purchasing

TJ/tcb

GENERAL TERMS AND CONDITIONS

1. **Preparation of Offers**

   1A. Offeror shall examine the drawings, specifications, schedule and all instructions. Failure to do so will be at the offeror's risk.

   1B. Each offeror shall furnish all information required. Erasures or other changes must be initialed by the person signing the offer. Offers must be signed by an authorized agent of the company.

2. The term "contractor" as used herein and elsewhere in these specifications shall be used synonymously with the term "successful offeror." The term "County" shall mean Fayette County.

3. **Submission of Offers**

   3A. Offers and amendments shall be enclosed in sealed envelopes, addressed to the office specified in the request for proposal with the name and address of the offeror, the reference and proposal number on the face of the envelope.

   3B. The offer, once submitted and opened, shall remain open for acceptance for a period of at least ninety days from the date of the opening of the proposals as set out in the request for proposal unless specifically excepted to in your offer.

   3C. Samples of items, when required, must be submitted within the time specified and, unless otherwise specified, at no expense to the County. Unless otherwise specified, samples will be returned at the offeror's request and expense if items are not destroyed by testing.

   3D. Fayette County shall not be responsible for the premature opening of a proposal not properly addressed and identified by proposal number and reference and/or delivered to an improper destination.

   3E. In case of discrepancy between the unit price and the extended or total price, the unit price shall prevail.

4. **Evaluation of Offers**

   The evaluation of offers and the determination as to acceptability of products or services offered shall be the responsibility of the County. Accordingly, to insure that sufficient information is available, the offeror may be required to submit literature, samples, references or other information prior to award.

5. **Non-Collusion**

   Offeror declares that the offer is not made in connection with any other offeror submitting an offer for the same services, and that the offer is bona fide and is in all respects fair and without collusion or fraud.

6. **Default**

   The contract may be cancelled or annulled by the Purchasing Director in whole or in part by written notice of default to the contractor upon non-performance or violation of contract terms. An award may be made to the next lowest satisfactory offeror, or articles specified may be purchased on the open market similar to those so terminated. In either event, the defaulting Contractor (or his surety) shall be liable to the County for cost to the County in excess of the defaulted contract prices provided, however, that the Contractor shall continue the performance of this contract to the extent not terminated under the provisions of this clause. Failure of the Contractor to deliver materials or services within the time stipulated on his offer, unless extended in writing by the Purchasing Director, shall constitute contract default.

7. **Patent Indemnity**

   The Contractor guarantees to save the County, its agents, officers, or employees harmless from liability of any nature or kind for use of any copyrighted or uncopyrighted composition, secret process, patented or unpatented invention, articles or appliances furnished or used in the performance of the contract, for which the Contractor is not the patentee, assignee or licensee.

8. None of the various County agencies, either individually or collectively, will be required to purchase any minimum amount during the term of this contract, nor will they be limited, either individually or collectively, to any maximum amount during the term of this contract.

9. The County reserves the right to increase or decrease quantities shown without penalty.

10. **Ability To Perform**

    The offeror may be required, upon request, to provide to the satisfaction of the County that he/she has the skill, experience and the necessary facilities as well as sufficient financial and human resources to perform the contract in a satisfactory manner and within the required time. If the available evidence is not satisfactory to the County, then the offer of such offeror may be rejected.

11. **Rejection of Offers**

    Failure to observe any of the instructions or conditions in this request for proposal shall constitute grounds for rejection of the offer.

12. All of the specifications and information contained in this request for proposal, unless specifically accepted to in writing and included with the offer, will form the basis of the contract between the successful offeror (the Contractor) and the purchaser. Caution should be taken by the offeror that all questions are answered in the spaces provided and all requested information is submitted.

13. Assignment of any contract resulting from this request for proposal will not be authorized.

14. This contract may be cancelled by either party upon submitting thirty (30) days written notice of intent to cancel to the other party.

15. The proposal opening is open to the public. After the process is completed and an award has been made, information may be obtained on the Fayette County website (www.fayettecountyga.gov) or in the Purchasing Department at .25 per page. Prices and other information will not be given out over the phone. If you would like the information mailed to you, the proper amount of postage along with the total price for copying the information shall be received in Purchasing in advance. Make checks payable to the Fayette County Board of Commissioners.

16. **If your Company has not previously applied to get on the Fayette County Bidders List, to insure your company is not omitted from participation in future bidding, it is important that you contact The Purchasing Department at 770-305-5420 immediately to find out how to be placed on the Bidders List. Participation in this request for proposal does not automatically place a Company on the Master Bidders List.**

ADDITIONAL INFORMATION AND INSTRUCTIONS

1. Respondents are urged to visit the site to familiarize themselves with site conditions. If a proposal is submitted it is understood that the respondent is acknowledging his acceptance of all site conditions.

2. The successful architectural firm shall be required to warranty his work for a period of at least one year after final acceptance by Fayette County of the work performed by the successful architectural firm.

3. Proposals will not be accepted from any person, firm, or corporation who is in arrears in any debt or obligation to Fayette County.

4. The proposal made by any company or firm must be signed in a legal manner in the name of such company or firm by a duly authorized officer, member or representative, whose name and representative capacity shall be stated, and the address of the principal place of business must be shown.

5. If the work described in this request for proposal is for roadway improvements and the proposed price is $5,000.00 or greater or if the proposed price for any other type work is $20,000.00 or greater, then a contract performance bond and a payment bond, each equal to 100% of the contract price with surety company satisfactory to the County, must be provided by the successful architectural firm by a surety company qualified to do business in Georgia. Bond given shall meet the requirements of Georgia Code Section 36-82-100 to 105. The bond shall be submitted in the name of the Fayette County Board of Commissioners prior to the work being commenced.

6. Include with your proposal a list of three (3) jobs that your company has done that is of the same or similar nature to the work described herein. For each job listed include a brief description of the work, a contact person, mailing address, phone number and the date job was completed.

7. Successful architectural firm shall be insured.

8. Successful contractor shall be responsible for removal and proper disposal of all debris from area.

9. **In compliance with Georgia Code Section 13-10-91, the attached Bidder's Affidavit of Compliance with the Georgia Security and Immigration Compliance Act must be completed, signed, notarized and returned with your bid.**

PLEASE FILL OUT AND RETURN WITH YOUR PROPOSAL THE BIDDER'S AFFIDAVIT OF COMPLIANCE, THE INFORMATION PAGE, PRICING SHEET AND REFERENCES PAGE.

Bidder's Affidavit
Of Compliance with the Georgia Security and Immigration Compliance Act

By executing this affidavit, the undersigned bidder verifies its compliance with O.C.G.A. 13-10-91, stating affirmatively that the individual, firm or corporation which is bidding to contract with Fayette County has registered with, and is authorized to use, the federal work authorization verification program [any of the electronic verification of work authorization programs operated by the United States Department of Homeland Security or any equivalent federal work authorization program operated by the United States Department of Homeland Security to verify information of newly hired employees, pursuant to the Immigration Reform and Control Act of 1986 (IRCA), P.L. 99-603].

The undersigned bidder agrees that it is using, and will continue to use, the federal work authorization program throughout the contract period.

The undersigned bidder further agrees that, should it employ or contract with any subcontractor(s) in connection with the physical performance of services pursuant to this proposed contract with Fayette County, bidder will secure from such contractor(s) similar verification of compliance with O.C.G.A. 13-10-91. Bidder further agrees to maintain records of such compliance and provide a copy of each such verification to Fayette County at the time the subcontractor(s) is retained to perform such service.

_____
E-Verify or other User Identification Number

_____ _____
BY: Authorized Officer or Agent Date
(Bidder's Name)

_____
Title of Authorized Officer or Agent of Bidder

_____
Printed Name of Authorized Officer or Agent

SUBSCRIBED AND SWORN
BEFORE ME ON THIS THE

_____ DAY OF _____, 20____

Notary Public
My Commission Expires:

_____

INSURANCE REQUIREMENTS

The successful offeror shall, without expense to the County, carry the following to be in effect throughout the term of the contract:

1. Third party property damage insurance in such amounts as are deemed adequate by the County and Board of Commissioners against all losses, cost, damages, claims, expenses, or liability whatsoever because of accidental injury or damage to person or property occurring in the course of or as a result of the construction of said facility, and any and all matters incidental thereto. A minimum amount of coverage in the amount of $500,000.00 is required; although, additional coverage may be required depending on the nature of the work to be performed. The successful offeror shall also carry adequate Workman's Compensation Insurance covering all employees engaged in cleaning of said facility.

2. Public Liability and Property damage insurance coverage including, but not limited to, the liability assumed in the indemnification provisions as specified in this RFP fully insuring the successful offeror for liability for injury to or death of county employees and third parties, extended to include personal injury liability coverage, and for damage to property of third parties, with a minimum combined coverage for each occurrence of $500,000.00 with an umbrella policy in the amount of one million dollars, $1,000,000.00.

3. A copy of the certificate of insurance for the afore mentioned shall be submitted with your offer. A request will be sent to the agent or the insurance company of the successful offeror to notify Fayette County 30 days prior to cancellation of or upon any material change in coverage of the afore mentioned insurance coverage prior to the work being completed. No award will be made until proof of the insurance coverage is submitted.

4. The successful offeror shall defend, indemnify and save harmless Fayette County and all its officers, agents and employees from all suits, actions, or other claims of any character, name and description brought for or on account of any injuries or damages received or sustained by any person, persons, or property on account of any negligent act or fault of the successful offeror, or of any agent, employee, subcontractor or supplier in the execution of, or performance under, any contract which may result from proposal award. Successful offeror shall pay any judgment with cost which may be obtained against Fayette County growing out of such injury or damages.

5. **The certificate holder should be:** **Fayette County Board of Commissioners**
140 Stonewall Avenue West
Fayetteville, GA 30214

FAILURE TO PERFORM

It is important to note that if a company is awarded all or part of this request for proposal, Fayette County expects the successful company to totally fulfill the contract and perform all duties hereunder satisfactorily, for the duration of the contract. Failure to so perform will result in said company being removed from the Fayette County Bidders list for that commodity.

INSTRUCTIONS FOR DOWNLOADING THE PLANS:

Plans can be downloaded from the Fayette Website in PDF Format at:
http://www.fayettecountyga.gov/purchasing/bids_and_proposals.asp

SELECTION OF THE DESIRED PROPOSAL WILL BE BASED ON THE FOLLOWING.

1. EXPERIENCE
2. WARRANTY
3. REFERENCES
4. COMPLETION TIME
5. PRICE

EXCEPTIONS TO SPECIFICATIONS

COMPANY NAME_____

PROPOSAL# P774

PRICING SHEET FOR LIBRARY EXPANSION CONSTRUCTION

DESCRIPTION	TOTAL PROPOSED AMOUNT
LIBRARY EXPANSION CONSTRUCTION	$_____

THE TOTAL PROPOSED AMOUNT SHALL INCLUDE ALL MATERIALS, PARTS, LABOR, CONSTRUCTION AND ANY OTHER APPLICABLE CHARGES AS LISTED HEREIN. NO ADDITIONAL CHARGES WILL BE ACCEPTED AFTER THE PROPOSAL OPENING.

State Payment Terms_____

State Length and Nature of Warranty **(Warranty will be a factor in the award.)**

_____

State Time Needed To Start Project After Notification of Award:
(Project start time will be a factor in the award.)

_____

State Time Needed To Complete The Project After Notification of Award:
(Job completion time will be a factor in the award.)

_____

State Length of Time after Proposal Opening that Proposal prices shall be held firm:

_____ Days.

Company Name_____

INFORMATION PAGE

Company_____

Authorized Representative_____
(Print or Type)

Authorized Representative_____
(Signature)

Title_____

Mailing Address_____

_____

Telephone Number: ( )_____

Fax Number: ( )_____

Email Address:_____

Date:_____

If you do not submit a proposal, indicate in writing your reason(s) why and return that information to the Purchasing Department. Failure to do so may cause your company's name to be removed from the bidders list.

REFERENCES

REFERENCE (1) _____

Job Description (Similar in Nature)

_____

Company Name

_____

Complete Mailing Address with City, State and Zip Code

_____

Contact Person Name (First & Last Name) and Telephone Number

REFERENCE (2) _____

Job Description (Similar in Nature)

_____

Company Name

_____

Complete Mailing Address with City, State and Zip Code

_____

Contact Person Name (First & Last Name) and Telephone Number

REFERENCE (3) _____

Job Description (Similar in Nature)

_____

Company Name

_____

Complete Mailing Address with City, State and Zip Code

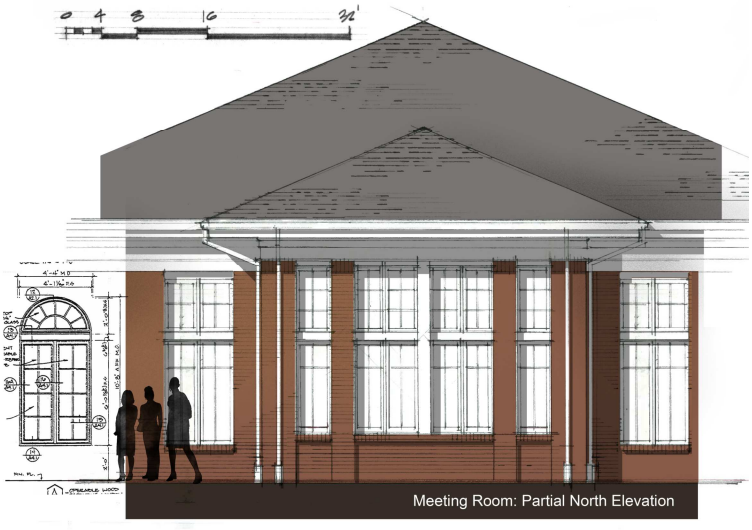
_____

Contact Person Name (First & Last Name) and Telephone Number

Company Name: _____

PROJECT MANUAL

Fayette County Public Library Addition



· **Lord, Aeck & Sargent, Inc.** ·
Architects

· **Davis & Church, LLC** ·
Structural Engineers

· **Covalent Consulting, LLC** ·
Mechanical, Electrical, and Plumbing Engineers

· **Eberly & Associates** ·
Civil Engineers & Landscape Architects

LAS Project Number 10050-00

October 22, 2010

100% Construction Documents

SECTION 00 0110

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END OF TABLE OF CONTENTS

SECTION 00 3000

INFORMATION AVAILABLE TO BIDDERS

EXISTING REPORTS AND SURVEYS

1.01 SUBSURFACE INVESTIGATION REPORT

A. A copy of a geotechnical report with respect to the building site is:
   1. Title: Subsurface Exploration and Geotechnical Engineering Evaluation, Fayette County Library Additions
   2. Date: April 5, 2010
   3. Prepared by: Pace Geotechnical Incorporated.
   4. A copy of the report is bound into the Project Manual immediately following this document.

B. This report identifies properties of below grade conditions and offers recommendations for the design of foundations, prepared primarily for the use of Architect.

C. The recommendations described shall not be construed as a requirement of this Contract, unless specifically referenced in the Contract Documents.

D. The Contractor is entitled to rely upon the factual information contained therein, such as locations and depths of tests or explorations made at the site and material encountered at each location, all as of the dates made. The Contractor is not entitled to rely upon the nonfactual information contained therein such as interpretations, opinions, or extrapolations of data; nor is the Contractor entitled to rely upon the completeness of the information for the Contractor's purposes.

E. This report, by its nature, cannot reveal all conditions that exist on the site. Should subsurface conditions be found to vary substantially from this report, changes in the design and construction of foundations will be made, with resulting credits or expenditures to the Contract Price accruing to Owner.

END OF SECTION

Subsurface Exploration and Geotechnical Engineering Evaluation
Fayette County Library Additions
1821 Heritage Park Way
Fayetteville, Georgia
PACE Project Number 4346

PACE GEOTECHNICAL INCORPORATED

April 5, 2010

Fayette County Maintenance Department
146 McDonough Road
Fayetteville, Georgia 30215

Attention: Mr. Greg Ownby

Subject: **Subsurface Exploration & Geotechnical Engineering Evaluation**
Fayette County Library Additions
1821 Heritage Park Way
Fayetteville, Georgia
PACE Project Number 4346

Gentlemen:

PACE Geotechnical, Inc. is pleased to provide this report of the subsurface exploration and geotechnical engineering evaluation for the referenced project. This exploration was conducted in general accordance with PACE Proposal Number 10-059 dated March 15, 2010 and authorized by you on March 22, 2010.

The purpose of the exploration was to obtain general subsurface data so that we could evaluate feasible foundation systems, general earthwork procedures, and potential excavation problems. This report presents our understanding of the project, the subsurface conditions encountered, and our recommendations for general earthwork procedures, foundations, and slabs.

PACE Geotechnical, Inc. appreciates the opportunity to be of service to you on this project. If you have any questions concerning this report, please contact us.

Respectfully submitted,

PACE Geotechnical, Inc.

Patrick B. Rhodes, P.E.
Senior Registered Engineer
GA Reg. No. 24586

Greg A. Wombough, P.E.
Senior Registered Engineer
GA Reg. No. 23817

80 Candler Road · Suite 100 · McDonough GA 30253
Office 770.376.3000 · Fax 770.376.3002
www.pacegeotech.com

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APPENDIX

REPORT OVERVIEW

The following summary provides an overview of our findings. Design recommendations are presented in the report text.

1. Four soil test borings were performed at the site. The borings encountered topsoil, asphalt pavements, fill soils, Piedmont residual soils, and groundwater.

2. A 3-inch thick layer of topsoil was initially encountered in borings B-1, B-2, and B-4 and asphalt paving was encountered in boring B-4. Underlying the topsoil and pavement section in borings B-2, B-3 and B-4, fill soils were encountered. The fill soils consisted of very loose to loose silty sands and extended from 2 to 3 feet below the ground surface. No concernable amounts of organics were noted in the fill soils. Some of the fill soils did have a dark brown appearance which could be indicative of having been mixed with topsoil. Some undercutting of the fill soils will be required in the southeastern corner of the southern building addition footprint.

3. Below the topsoil in boring B-1 and below the fill soils in borings B-2, B-3 and B-4, Piedmont residual soils were encountered. The residual soils consisted of firm to stiff silts and clays and loose to firm silty and clayey sands. The residual soils extended to the boring termination depth of 15 feet below the ground surface.

4. Groundwater was encountered at a depth of 14 feet below the existing ground surface in boring B-4 at the time of drilling. Groundwater was not encountered in the other three borings at the time of drilling. Groundwater is not anticipated to impact the proposed construction.

5. Excavations in the fill and residual soils can be accomplished using conventional heavy earthmoving equipment such as dozers and large tracked excavators. Materials requiring difficult excavation techniques are not anticipated to be encountered during site grading, utility installation, or foundation construction.

6. The residual soils and a majority of the fill soils encountered are suitable to be used as structural fill. Due to the elevated moisture content of some of the fill soils, they will require significant drying prior to being used as structural fill.

7. The proposed building additions can be supported on shallow foundations bearing on residual soils and new structural fill. We recommend the shallow foundations be designed with a net allowable soil bearing pressure of 2,000 psf. We recommend that all foundation excavations be evaluated prior to concrete placement. Some isolated undercutting should be expected in the southern building addition foundations.

PROJECT INFORMATION

We understand that two additions are proposed at the Fayette County Library in Fayetteville, Georgia. One addition is proposed at the northwestern corner along the north wall of the library and will encompass 1,000 square feet and the other is proposed at the southeastern corner along the southern wall of the library and will encompass 4,200 square feet. The additions will be single story with similar construction and finished floor elevation as the existing library. Therefore, we anticipate that cuts and fills of less than 2 feet will be required to match the exiting finished floor elevation of the library and maximum structural loads will be less than 100 kips for columns and 3 kips per linear foot for walls.

EXPLORATION AND TESTING PROCEDURES

The site was explored by a combination of a visual site reconnaissance and the performance of four soil test borings, designated as B-1 through B-4. Borings B-1 and B-4 were drilled within the footprint of the northern building addition and borings B-3 and B-4 were drilled in the footprint of the southern building addition. The boring locations were determined in the field based on the provided plans and by the proposed building corners which were marked by Fayette County. The boring locations are shown on the Boring Location Plan in the Appendix and should be considered approximate.

The soil test borings were advanced by twisting continuous hollow stem auger flights into the ground. At selected intervals, Standard Penetration Testing (SPT) was performed in general accordance with ASTM D-1586 and soil samples were collected for visual classification. The results of the SPT, when properly evaluated, provide an indication of the relative consistency of the soil being sampled, the potential for difficult excavation, and the soil's ability to support loads. After the borings were completed, the presence of groundwater was checked and the boreholes were backfilled with the auger cuttings. A more detailed description of the drilling and sampling process is included in the Appendix of this report.

Soil samples recovered during the drilling process were returned to our laboratory where they were classified by a member of our engineering staff. Detailed descriptions of the materials encountered at each boring location, along with results of the SPT, are shown on the Soil Boring Records in the Appendix.

SITE AND SUBSURFACE CONDITIONS

Site Conditions

The northern building addition is located at the northeastern corner of the existing Fayette County library building at 1821 Heritage Park Way. The areas adjacent to the northeastern corner of the building are landscaped with shrubbery and grass. A stormwater sewer pipe crosses the central

portion of the proposed building addition in an east to west direction. The site is relatively level with less than 1-foot of topographic relief.

The southern building addition is located at the southeastern corner of the library. The areas adjacent to the southeastern corner of the building are landscaped with shrubbery and are asphalt paved driveways and parking lots. Asphalt pavement distress consisting of joint separation and alligator cracking is visible across the asphalt surface. A drop inlet is located at the corner of the existing building and a stormwater sewer pipe runs across the eastern side of the proposed building addition. The site is relatively level with less than 2 feet of topographic relief.

Area Geology

The site is located in Georgia's Piedmont Physiographic Province. The residual soils in the Piedmont are the result of the chemical and physical weathering of the underlying parent metamorphic and igneous rock. A common soil profile usually consists of fine grained clayey silts and silty clays near the surface, where weathering is more advanced. With depth, less clayey, coarser grained soils such as sandy silts and silty sands with varying mica content are encountered. Separating the completely weathered soil overburden from the unaltered parent rock is a transition zone of very high consistency weathered rock locally referred to as Partially Weathered Rock (PWR). Partially weathered rock is arbitrarily defined as residual soils with Standard Penetration Resistances in excess of 100 blows per foot (50 blows per 6 inches).

Fill soils have been placed by man in conjunction with previous construction activity. Fill can be composed of different soil types from various sources and can also contain debris from building construction, organics, topsoil, trash, etc. The engineering properties of fill depend primarily on its composition, density, and moisture content. We recommend that any documentation that is available on previous site development and existing fill placement be forwarded to PACE for review.

Subsurface Conditions

The soil test borings encountered topsoil, asphalt pavements, fill soils, Piedmont residual soils, and groundwater. A 3-inch thick layer of topsoil was initially encountered in borings B-1, B-2, and B-4. A pavement section consisting of 2 inches of asphalt underlain by 4 inches of graded aggregate base was initially encountered in boring B-4. Underlying the initial topsoil and pavement layers in borings B-2, B-3, and B-4 were fill soils consisting of very loose to loose silty sands that extended from 2 to 3 feet below the ground surface. No concernable amounts of organics were noted in the fill soils but some of the fill soils encountered in borings B-3 and B-4 did have a dark brown appearance which could have been due to topsoil being blended into them during placement. Standard Penetration Test (SPT) values (N-values) ranged from 4 to 9 blows per foot (bpf) in the fill soils. These values indicate that the fill soils were lightly to moderately compacted when placed and are variable with respect to consistency.

Piedmont residual soils were encountered from below the topsoil in boring B-1 and below the fill soils in borings B-2 through B-4. The residual soils consisted of firm to stiff silts and clays and

loose to firm silty and clayey sands. The SPT values recorded in the residual soils ranged from 7 to 13 bpf. The residual soils extended to the boring termination depth of 15 feet below the ground surface in all four borings.

Groundwater was not encountered at the time of exploration in borings B-1 through B-3 and was encountered in boring B-4 at a depth of 14 feet at the time of exploration. However, some of the residual soil samples retrieved at depths of 13 feet to 15 feet below the existing ground surface in borings B-1 through B-3 had elevated moisture contents, which normally indicates the presence of groundwater. Due to the fine-grained nature of the soils at the site, the boreholes might not have been left open for a sufficient period of time to establish accurate stabilized groundwater levels. We note that groundwater levels will fluctuate with yearly and seasonal climatic variations and can be influenced by drainage features. Groundwater may be at different elevations in the future. The site and surrounding areas have recently had elevated amounts of rain and we expect that groundwater levels are at or near their highest levels.

LIMITATIONS OF CONCLUSIONS AND RECOMMENDATIONS

This evaluation of the geotechnical aspects of the proposed design and construction has been based on our understanding of the project and the data obtained during this study. The general subsurface conditions used in our evaluation were based on interpolation of the subsurface data between the borings. Regardless of the thoroughness of a subsurface exploration, there is the possibility that conditions will differ between boring locations, that conditions are not as anticipated by the designers, or that the construction process has modified the soil conditions.

The recommendations contained in this report have been developed on the basis of the previously described project characteristics and subsurface conditions. If project criteria change, we should be permitted to determine if the recommendations should be modified. The findings of such a review will be presented in a supplemental report. Even after completion of a subsurface study, the nature and extent of variation between borings may not become evident until the course of construction. If such variations then become evident, it will be necessary to reevaluate the recommendations of this report after on-site observations of the conditions.

These professional services have been performed, the findings derived, and recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. This warranty is in lieu of all warranties either expressed or implied. This company is not responsible for the conclusions, opinions or recommendations of others based on these data.

CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations are based on the data gathered during this exploration, our understanding of the proposed construction, our experience with similar site and subsurface conditions and generally accepted principles and practices of geotechnical engineering.

Should the proposed construction change significantly from that described in this report, we request that we be advised so that we may amend these recommendations accordingly. This report, and the conclusions and recommendations provided herein, are provided exclusively for the use of Fayette County and their design professionals and is intended solely for design of the referenced project.

General

Fill soils with low to moderate consistencies were encountered in borings B-2, B-3 and B-4 and extended to depths of approximately 2 to 3 feet below the existing ground surface within the proposed building addition footprints. Some of the fill soils should be suitable to remain in-place for structural support and some fill soils will require undercutting. It should be noted that fill soils can be highly variable with respect to material type and compaction effort and can differ significantly over short distances horizontally and vertically. Due to their variability, there are risks associated with building structures directly on undocumented fill. Risks, such as excessive settlement, are inherent for buildings supported on poorly compacted fill. Complete removal and replacement is the only option to eliminate this risk. Based on the information obtained in the borings, we expect these risks to be higher in the southern building addition than the northern building addition. The risks will be greatly decreased if the recommendations presented in the following sections are implemented. The recommendations focus on thorough evaluations and undercutting of any low consistency fill soils during site grading and foundation construction.

Earthwork Recommendations

The majority of the soils encountered at the site are silty in nature and moisture-sensitive. When exposed to moisture, the workability and strength of these type soils deteriorates significantly and construction delays may result. Surface water management will be an important component of construction. We recommend that construction grades be maintained throughout this project in such a manner to establish positive drainage away from working surfaces and subgrades. Vehicular traffic should be avoided or minimized on exposed surfaces.

Once the construction phase surface water management methods have been adopted and implemented, the initial step in site preparation should be the clearing vegetation and the stripping of topsoil and pavements. Stripping and clearing should extend 10 feet beyond planned construction limits. Topsoil should be stockpiled outside of fill areas and may be used as landscaping materials or hauled off-site. All existing utilities should be properly abandoned and removed. Excavations resulting from the demolition activities that extend below the finish grades should be evaluated by a geotechnical engineer and backfilled with structural fill.

After site preparation is completed, the exposed subgrade soils should be evaluated within at-grade areas and areas to receive fill. This approval process should include proofrolling the subgrade with a fully loaded tandem axle dump truck (20 tons) during a period of dry weather and under the observation of the geotechnical engineer. Any areas which "pump" or "rut" excessively under the weight of the proofrolling vehicle should be further evaluated and may require undercutting or other remediation. Proofrolling can occasionally detect pits where stumps or other debris may have been

buried, or other areas where weak surface conditions exist. Proofrolling and subgrade evaluations will be important since the site has been previously developed and low consistency fill soils are present near the surface. Some isolated undercutting should be expected within the southern addition footprint. We anticipate that undercutting will be limited to the fill soils encountered from near the ground surface to three feet below the ground surface. However, the extent of the undercutting will be dependent on climatic conditions during construction. If undercutting is performed during a period of increased rainfall deeper undercut depths may be required.

After subgrade evaluations and any remedial actions (undercutting) are complete, the site can be brought to final grades by excavation or structural fill placement. Excavations within the residual and fill soils can be accomplished using conventional heavy earthmoving equipment such as dozers and large tracked excavators. Materials requiring difficult excavation techniques are not anticipated to be encountered during site grading, utility installation, or foundation construction.

The residual soils and a majority of the fill soils at the site are suitable for reuse as structural fill. Soils containing significant amount of organics should not be used as structural fill. They should be hauled off-site or may be used as landscaping materials. Moisture control of the structural fill will be necessary, primarily depending on the weather conditions at the time of construction and the natural moisture content of the in-place soils. Some of the in-place soils will require extensive drying prior to reuse as structural fill. The amount of drying will be dependant on climatic conditions prior to and during construction. If the moisture content of these soils cannot be sufficiently lowered to achieve the compaction requirements for structural fill, they will need to be wasted in non-structural areas or hauled off-site.

All structural fill should be compacted to at least 95 percent of the soil's standard Proctor maximum dry density, as determined by ASTM standard D-698. The upper foot of fill which will support pavements or slabs should be compacted to at least 98 percent of the soil's standard Proctor maximum dry density for improved support. In areas which are at or above the finished grade, and which will support pavements or slabs, the upper 8 inches immediately below these systems should be scarified and recompacted to the 98 percent criteria. Structural fill should be free of organic material, have a plasticity index (PI) less than 20, and contain rock sizes no larger than 4 inches.

Structural fill should extend horizontally beyond the outer edge of the building foundations at least 10 feet or a distance equal to the height of the fill to be placed, whichever is greater. In paved areas, fill slopes should extend at least five feet beyond the edge of pavement.

Density testing should be performed by a soils technician to determine the degree of compaction and verify compliance with the project specifications. For under-floor areas, at least one field density test should be made per 3,000 square feet of fill area for each two-foot lift. Testing frequency should be increased in confined areas. Areas which do not meet the compaction specifications should be recompacted to achieve compliance. In confined areas, such as utility trenches, the use of portable compaction equipment and thin lifts of 3 to 4 inches may be required to adequately achieve the compaction requirements.

Groundwater is not anticipated to impact the proposed construction at the depths that it was encountered.

Foundation Recommendations

The proposed building additions can be supported on shallow foundations bearing on the in-place residual soils, thoroughly evaluated existing fill soils, and new structural fill using a net allowable soil bearing pressure of 2,000 psf.

Foundations should be designed with minimum foundation widths of 24 inches and 18 inches for individual column and strip footings, respectively, to preclude the possibility of localized soil bearing failures. All exterior foundations should bear at least 12 inches below external grades to prevent frost damage.

All foundation excavations should be evaluated by a geotechnical engineer, who will verify that the design bearing pressure is available intermediate of boring locations, and that foundations are not immediately underlain by undesired conditions. If the engineer finds localized conditions unsatisfactory to support the recommended soil bearing pressure below an individual foundation, they should be undercut. Some isolated undercutting of individual foundations should be expected in the southern building addition.

Where undercutting of the foundations is needed, the undercut excavation should be backfilled with structural fill, compacted aggregate, or concrete. The structural fill should be compacted to a density equal to at least 95 percent of the soils standard Proctor maximum dry density. If structural fill is used to backfill the undercut areas, the excavations should be widened horizontally a distance equal to one-half the depth of undercutting prior to fill placement. The aggregate may either be well compacted ASTM C-33 designation No. 57 clean graded aggregate or crusher run aggregate compacted to at least 95 percent of the standard Proctor (ASTM D-698) maximum dry density. Clean graded aggregate (No. 57) may be desirable since it can be placed immediately after undercutting is complete with minimal compaction effort and is not as sensitive to climatic conditions as the other backfill options.

Exposure to the environment may weaken the soils at the foundation bearing level if the foundation excavations remain open for long periods of time. Therefore, we recommend that, once foundation excavation is extended to final grade, it be constructed as soon as possible to minimize the potential damage to bearing soils. The foundation bearing area should be level or benched and free of loose soil, ponded water, and debris. Foundation concrete should not be placed on soils that have been disturbed by seepage. If the bearing soils are softened by surface water intrusion or exposure, the softened soils must be removed from the foundation excavation bottom immediately prior to placement of concrete. If the excavation must remain open overnight or if rainfall becomes imminent while the bearing soils are exposed, we recommend that a two to four inch thick "mud mat" of "lean" (2,000 psi minimum compressive strength) concrete be placed on the bearing soils before the placement of reinforcing steel for protection.

Floor Slab Recommendations

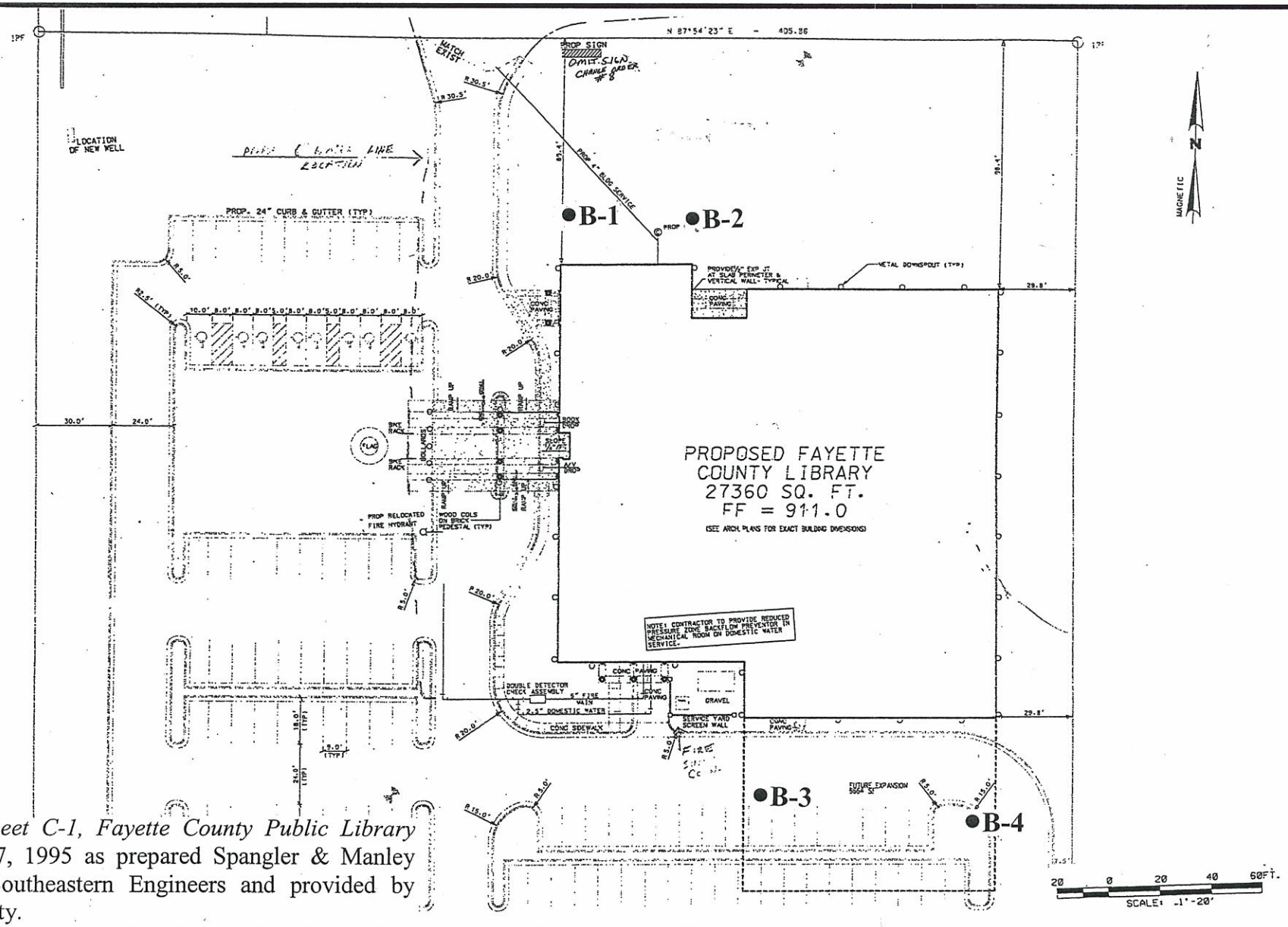
Floor slabs may be soil supported on the in-place residual soils or new structural fill. Groundwater levels are not anticipated to approach the finished floor elevations of the proposed building additions. Therefore, an underslab crushed stone drainage layer is considered optional. We recommend that a vapor barrier be included beneath all soil supported floor slab areas that are to receive moisture sensitive coverings.

Slab subgrade soils are often disturbed after final grading due to ongoing construction activities and weather conditions and as a result lose their support capabilities. We recommend that slab subgrades that have been disturbed be proofrolled immediately prior to construction of the slab. Additionally, any excavations through the subgrade soils (such as utility trenches) should be properly backfilled with structural fill. Recompaction of subgrade surfaces and compaction of backfill should be checked with a sufficient number of density tests to determine if adequate compaction is being achieved.

Temporary and Permanent Slopes

Permanent and temporary slopes may be used to accommodate grade changes. If temporary slopes are used, they should be constructed no steeper than 1.5H:1V for slopes less than 15 feet high. All OSHA guidelines should be followed for temporary slopes. Permanent slopes should be constructed no steeper than 2H:1V. These recommendations are based on experience with similar conditions and no detailed slope stability analyses have been performed. Buildings should be set back at least 10 feet from the top of slopes and a minimum of 5-foot setback from the top of slopes is considered sufficient for pavement areas. All finished slopes should be suitably protected from erosion.

APPENDIX



Based on *Sheet C-1, Fayette County Public Library* dated April 7, 1995 as prepared Spangler & Manley Architects, Southeastern Engineers and provided by Fayette County.

Legend:

Soil Test Boring ●

PACE GEOTECHNICAL INCORPORATED

80 Candler Road
McDonough, Georgia 30253

Boring Location Plan
Fayette County Library Additions
1821 Heritage Park Way
Fayetteville, Georgia
PACE Project Number 4346

SOIL TEST BORING PROCEDURES (ASTM D 1586)

The soil test borings were advanced by twisting continuous auger flights into the ground. At selected intervals, soil samples were obtained by driving a standard 1.4 inch I.D., 2.0 inch O.D., split tube sampler into the ground. The sampler was initially seated six inches to penetrate any loose cuttings created in the boring process. The sampler is then driven an additional 12 inches by blows of a 140 pound "hammer" falling 30 inches. The number of blows required to drive the sampler the final foot is designated the Standard Penetration Resistance.

The samples recovered were sealed in glass jars and were transported to the office where they were classified by an engineer.

CORRELATION OF STANDARD PENETRATION RESISTANCE WITH RELATIVE CONSISTENCY

Sand and Gravel

Standard Penetration Resistance Blows / Foot	Relative Consistency
0 - 4	Very Loose
5 - 10	Loose
11 - 20	Firm
21- 29	Very Firm
30 - 50	Dense
Over 50	Very Dense

Silt and Clay

Standard Penetration Resistance Blows / Foot	Relative Consistency
0 - 1	Very Soft
2 - 4	Soft
5 - 8	Firm
9 - 15	Stiff
16 - 30	Very Stiff
31 - 50	Hard
Over 50	Very Hard

PACE Geotechnical, Inc.
80 Candler Road, Suite 100
McDonough, Georgia 30253

Soil Boring Record

Project Name: Fayette County Library Additions
Project No: 4346
Location: Fayetteville, Fayette County, Georgia
Client: Fayette County Maintenace Department
Drilling Method: 2 1/4" HSA
Date Drilled: 3/29/2010
Elevation:
Water Level: ---
Remarks: Groundwater was not encountered at time of boring

DESCRIPTION	DEPTH FT.	DCP	Blow/Incr. (1.75")	Opt. MC (%)	Max. DD (pcf)	% Fines	Plasticity Index	REMARKS
Topsoil 3 inches								
0.3 **Residuum** Firm - Red/Brown - Clayey Fine SAND (SC)			12					
3.0 Stiff - Tan, Orange - Fine Sandy SILT (ML), Micaceous	5		9					
			9					
	10		9					
13.0 Firm - Tan, Orange - Fine Sandy SILT (ML), Micaceous, Moist	15		8					
15.0 Boring terminated at 15 feet								

PACE Geotechnical, Inc.
80 Candler Road, Suite 100
McDonough, Georgia 30253

Soil Boring Record

Project Name: Fayette County Library Additions
Project No: 4346
Location: Fayetteville, Fayette County, Georgia
Client: Fayette County Maintenace Department
Drilling Method: 2 1/4" HSA
Date Drilled: 3/29/2010
Elevation:
Water Level: ---
Remarks: Groundwater was not encountered at time of boring

DESCRIPTION	DEPTH FT.	DCP	Blow/Incr. (1.75")	Opt. MC (%)	Max. DD (pcf)	% Fines	Plasticity Index	REMARKS
Topsoil - 3 inches								
0.3 **Fill** Loose - Red/Brown - Silty Fine SAND (SM), Some Clay, Micaceous			9					
2.0 **Residuum** Loose - Red/Brown - Clayey Fine SAND (SC), Moist	5		10					
			9					
8.0 Loose - Red/Brown, Tan - Silty Fine SAND (SM), Micaceous	10		10					
13.0 Firm - Brown, Tan, Gray - Fine Sandy SILT (ML), Moist	15		8					
15.0 Boring terminated at 15 feet								

PACE Geotechnical, Inc.
80 Candler Road, Suite 100
McDonough, Georgia 30253

Soil Boring Record

Boring B-3

Project Name: Fayette County Library Additions
Project No: 4346
Location: Fayetteville, Fayette County, Georgia
Client: Fayette County Maintenace Department
Drilling Method: 2 1/4" HSA
Date Drilled: 3/29/2010
Elevation:
Water Level: ---
Remarks: Groundwater was not encountered at time of boring

DESCRIPTION	DEPTH FT.	DCP	Blow/Incr. (1.75")	Opt. MC (%)	Max. DD (pcf)	% Fines	Plasticity Index	REMARKS
Asphalt 6 inches								
0.5 **Fill** Loose - Red/Brown, Dark Brown - Silty Medium to Fine SAND (SM), Some Clay, Root Fragments, Moist			7					
3.0 **Residuum** Firm - Brown, Gray - Sandy CLAY (CL), Moist	5		7					
6.0 Firm - Light Gray, Yellow - Clayey SILT (ML), Moist			8					
	10		8					
13.0 Firm - Brown, Tan - Fine Sandy SILT (ML), Very Micaceous, Very Moist			8					
15.0 Boring terminated at 15 feet	15							

PACE Geotechnical, Inc.
80 Candler Road, Suite 100
McDonough, Georgia 30253

Soil Boring Record

Project Name: Fayette County Library Additions
Project No: 4346
Location: Fayetteville, Fayette County, Georgia
Client: Fayette County Maintenace Department
Drilling Method: 2 1/4" HSA
Date Drilled: 3/29/2010
Elevation:
Water Level: 14 ATD
Remarks: Groundwater was encountered at 14 feet at time of boring

DESCRIPTION	DEPTH FT.	DCP	Blow/Incr. (1.75")	Opt. MC (%)	Max. DD (pcf)	% Fines	Plasticity Index	REMARKS
0.3 **Topsoil** - 3 inches **Fill** Very Loose - Red/Brown, Dark Brown, Silty Fine SAND (SM), Root Fragments, Micaceous, Moist			4					
3.0 **Residuum** Firm - Tan, Red, Gray - Clayey Medium to Fine SAND (SC)	5		13 13					
8.0 Firm - Tan, Red, Gray - Silty Fine SAND (SM), Some Clay, Moist	10		8					
13.0 Stiff - Brown, Tan - Fine Sandy SILT (ML), Very Micaceous, Very Moist			9					
15.0 Boring terminated at 15 feet	15							

SECTION 01 1000
SUMMARY

PART 1 GENERAL

1.01 OWNER OCCUPANCY

A. Owner intends to continue to occupy adjacent portions of the existing building during the entire construction period.

B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

C. Schedule the Work to accommodate Owner occupancy.

1.02 CONTRACTOR USE OF SITE

A. Construction Operations: Limited to areas noted on Drawings.

B. Arrange use of site to allow:
   1. Owner occupancy.
   2. Use of site by the public.

C. Provide access to and from site as required by law and by Owner.

D. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.

E. Do not obstruct roadways, sidewalks, or other public ways without permit.

F. Existing building spaces may not be used for storage.

G. Time Restrictions:
   1. Limit conduct of especially noisy exterior work to the hours of 8:30 AM to 5:30 PM.

H. Utility Outages and Shutdown:
   1. Limit disruption of utility services to hours when the building is unoccupied and when approved by the Owner.
   2. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without notice to and approval from the Owner. Secure the approval of authorities having jurisdiction when required.
   3. Prevent accidental disruption of utility services to other facilities.

1.03 WORK SEQUENCE

A. Coordinate construction schedule and operations with Owner.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 1120

GENERAL - SITEWORK

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Site work includes the work shown and reasonably inferred from the drawings, technical specifications, and contract documents. Provide materials, labor, equipment and supervision required to perform the work complete.

B. The scope of site work includes, but is not limited to the following:
   1. Construction staking and other construction engineering required to control the work.
   2. Erosion and sedimentation control construction.
   3. Temporary groundwater control.
   4. Site preparation, including stripping and undercutting unsuitable subgrade soils, demolition, and removal from the project lands of materials not to be used for construction.
   5. Site grading, including excavation, filling, compaction, and preparation of subgrades for paving. Site grading includes importing material, stockpiling and hauling from stockpiles, and other work necessary to construct embankments and excavations as shown and specified.
   6. Construction and building pads and staging areas.
   7. Coordination of temporary utilities.
   8. Installation of the site drainage system complete, including building roof drain laterals.
   9. Installation of water distribution and sanitary sewer system complete, including service laterals.
   10. Construction of curbs.
   11. Construction of paving.
   12. Striping and traffic control.
   13. Backfilling curbs and islands with approved soils for planting.
   14. Backfilling walls.
   15. Installation and coordination of temporary warning signs, directional signs, barricades and fences required to direct, control and protect the public throughout the construction period.
   16. Coordination of installation of light poles and conduits.

1.02 SAFETY

A. Safety & Protection: Initiate, maintain, and supervise safety precautions and programs in connection with the Work. Take necessary precautions for the safety of, and provide the necessary protection to prevent damage, injury or loss to employees on the job and other persons or organizations.

B. Safe trench construction is mandatory. Lay back slopes or shore as necessary.

C. Control traffic during operations on existing streets.

D. Erect and maintain barricades, fences, and other physical blockages sufficient to exclude the public from construction areas.

1.03 PROTECTION OF ADJACENT LANDS

A. Limit construction to areas so indicated on the drawings and designated by the Owner. Protect areas beyond the construction which are subject to the effect or byproduct of the construction effort.

B. Make special effort to prevent soil erosion and sediment transport onto adjacent lands. Restore disturbance to areas outside the designated construction limits to a satisfactory condition, as determined by the Owner or governing authority, at no cost to the Owner.

C. Take precautionary measures to prevent damage to the adjoining public street system. Clean mud or debris deposited as a result of this construction.

D. Perform construction on the right-of-way or on other properties not in possession of the Owner in strict accordance with the terms of the permits or easements. Obtain copies of permit and easement conditions affecting the work.

1.04 CONSTRUCTION ENGINEERING

A. Provide construction staking, dimensional control, and related construction engineering for phases of the Work.

1.05 GEOTECHNICAL ENGINEERING

A. Geotechnical quality control services will be performed by a geotechnical engineering firm (referred to as the Geotechnical Engineer) selected and hired by the Owner.

B. Provide in cooperation with the Geotechnical Engineer, as a minimum, monitoring and testing services of earthwork, drainage, utility construction, site preparation and demucking, underdrain construction, and pavement construction. Report results of tests verbally on completion of the work and provide daily written reports at the job site.
   1. Fill Placement: Monitor placement of fill for suitability of fill materials, uniformity of compaction operations, and compliance with aspects of these Specifications. Test soil fill for compliance with compaction requirements. Monitor rock fill for appropriate placement procedures, particle size, and lift thickness.
   2. Stripping and Demucking: Evaluate subgrades upon which fill is to be placed prior to fill placement. Monitor conditions and make appropriate recommendations. In the event of unstable subgrades, soil bridging, or provide stabilization stone as required. Discuss with the Owner, who will then authorize the procedure to be used.
   3. Underdrains: Monitor underdrain construction for compliance with the plans and specifications. If unforeseen conditions which impact the design and construction of underdrains are encountered, make appropriate recommendations to the Owner.
   4. Underground Utilities: Monitor installation of underground utilities and structures for compliance to specifications for materials, procedures, and workmanship. Evaluate the suitability of the subgrade upon which the pipes are to be constructed. Issue appropriate recommendations if unsuitable conditions are detected.
   5. Backfilling: Monitor backfills and test to evaluate compliance with the specifications.
   6. Retaining Walls: Provide monitoring and testing services during construction of retaining walls. The actual scope of these services will be dependent upon the type of wall used. Comply with the practice recommended by the designer of the wall system.

7. Pavements: Monitor preparation and proofrolling of the soil subgrade upon which pavements are to be constructed. When unstable soils are encountered, recommend appropriate remedial action to the Owner, who will then direct the Contractor as to the course of action. Monitor construction of the pavement system. Test thickness, gradations, and compactions of base course and surface course.

1.06 RESPONSIBILITY OF THE CONTRACTOR

A. The Contractor is responsible for compliance with the Contract Documents. Monitoring and testing by the Geotechnical Engineer does not infer acceptance of responsibility by the Geotechnical Engineer, the Architect, the Engineer, or the Owner. When monitoring and testing indicates that construction does not meet Specification requirements, rework to obtain compliance.

1.07 AS-BUILT PLANS

A. Maintain "Contractor's mark-up as-built" plans of construction. Certify the accuracy and completeness of these plans and deliver to the Owner. The Owner shall deliver a sepia reproducible, if requested, to facilitate final recording.

B. Prepare as-built plans of construction to be dedicated to Governmental entities and deliver in a form that is acceptable to the receiving agency.

C. As-built topographic maps of detention structures are required. Provide a topographic survey sufficient to confirm structure volume as well as dimensions and deviations of outlet structures.

D. Retain a registered surveyor to certify as-built surveys required above.

1.08 PAYMENT

A. The Technical Specifications for Sitework contain limited information relative to payment. Consult other divisions for detailed payment provisions.

END OF SECTION

SECTION 01 2000
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for progress payments.

B. Documentation of proposed changes in Contract Sum and Contract Time.

C. Contract Change procedures.

1.02 SCHEDULE OF VALUES

A. Submit a printed schedule that accurately reflects the fair market value of the several portions of the work in a form acceptable to the Architect.

B. Submit a printed schedule showing each item of work and using the Table of Contents of this Project Manual as a guide. Identify each line item with number and title of the specification Section, breaking down individual sections into discrete items of work to facilitate evaluation of completion.

C. For unit price work, identify quantities taken from the Contract Documents multiplied by the Contract unit price to achieve the total for the item.

D. Revise schedule to list approved Change Orders, with each Application For Payment.

1.03 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: Submit at intervals stipulated in the Agreement.

B. Present required information in typewritten form.

C. Form: AIA G702 Application and Certificate for Payment plus either AIA G703 Continuation Sheet or Contractor's electronic media driven form as continuation sheet.

D. Execute certification by signature of authorized officer.

E. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of Work.

F. Submit three copies of each Application for Payment.

G. Affidavits attesting to off-site stored products.

H. When Architect requires substantiating information, submit data justifying dollar amounts in question.

1.04 MODIFICATION PROCEDURES

A. Architect will advise of minor changes in the Work not involving an adjustment to Contract Sum or Contract Time as authorized by the Conditions of the Contract.

B. Construction Change Directive: Architect may issue a document, signed by Owner, instructing Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
   1. The document will describe changes in the Work, and will designate method of determining any change in Contract Price or Contract Time.
   2. Promptly execute the change in Work.

C. Proposal Request: Architect may issue a document which includes a detailed description of a proposed change with supplementary or revised Drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within 15 days.

D. Contractor may propose a change by submitting a request for change to Architect, describing the proposed change and its full effect on the Work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation and a statement describing the effect on Work by separate or other contractors.

E. Computation of Change in Contract Amount:
   1. For change requested by Architect for work falling under a fixed price contract, the amount will be based on the approved Schedule of Values.
   2. For change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Architect.
   3. For pre-determined unit prices and quantities, the amount will be based on the fixed unit prices.
   4. For change ordered by Architect without a quotation from Contractor, the amount will be determined by Architect based on the Contractor's substantiation of costs as specified for Time and Material work.

F. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract on AIA G701.

G. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.

H. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.

I. Promptly enter changes in Project Record Documents.

1.05 SUBSTANTIATION OF COST OF PROPOSED CONTRACT MODIFICATIONS

A. Provide full information required for evaluation:
   1. Quantities of materials and the cost thereof including shipping to the site.
   2. Manhours of labor and hourly cost including payroll taxes, insurance, and benefits for each skill or labor classification.
   3. Quantities and costs of equipment, tools, and other material not incorporated into the work.
   4. Overhead and profit.
   5. Justification for any change in Contract Time.
   6. Credit for deletions from Contract, similarly documented.
   7. Other information requested by the Architect.

B. For Time and Material work, submit itemized account and supporting data as the work progresses and after completion of change, within time limits indicated in the Conditions of the Contract.

1.06 APPLICATION FOR FINAL PAYMENT

A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.

B. Application for Final Payment will not be considered until the following have been accomplished:
   1. All closeout procedures specified in Section 01 7000.

END OF SECTION

SECTION 01 3000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preconstruction meeting.

B. Progress meetings.

C. Construction progress schedule.

D. Progress photographs.

E. Procedural requirements for submittals for review, information, and project closeout.

1.02 SUBMITTALS

A. Construction progress schedule.

B. List of proposed major products.

C. List of proposed subcontractors.

D. Documentation of deteriorated existing conditions to remain.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRECONSTRUCTION MEETING

A. Contractor shall schedule a meeting at the Project site prior to Contractor occupancy.

B. Attendance Required:
   1. Contractor.
   2. Owner.
   3. Architect.
   4. Contractor's Superintendent.

C. Agenda:
   1. Submission of list of Subcontractors, list of Products, schedule of values, and progress schedule.
   2. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
   3. Scheduling.
   4. Use of premises by Owner and Contractor.
   5. Owner's requirements and occupancy prior to completion.
   6. Construction facilities and controls provided by Owner.
   7. Temporary utilities provided by Owner.
   8. Survey and building layout.
   9. Security and housekeeping procedures.
   10. Schedules.
   11. Application for payment procedures.
   12. Procedures for testing.
   13. Procedures for maintaining record documents.
   14. Requirements for start-up of equipment.
   15. Inspection and acceptance of equipment put into service during construction period.

D. Record minutes and distribute copies within two days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

3.02 PROGRESS MEETINGS

A. Progress meetings will be held at monthly intervals.

B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

C. Attendance Required: Job superintendent, major Subcontractors and suppliers, Owner, Architect, as appropriate to agenda topics for each meeting.

D. Agenda:
   1. Review minutes of previous meetings.
   2. Review of Work progress.
   3. Field observations, problems, and decisions.
   4. Identification of problems which impede planned progress.
   5. Review of submittals schedule and status of submittals.
   6. Review of off-site fabrication and delivery schedules.
   7. Maintenance of progress schedule.
   8. Corrective measures to regain projected schedules.
   9. Planned progress during succeeding work period.
   10. Maintenance of quality and work standards.
   11. Effect of proposed changes on progress schedule and coordination.
   12. Other business relating to Work.

E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.03 CONSTRUCTION PROGRESS SCHEDULE

A. Within 10 days after date of the Agreement, submit preliminary schedule.

B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.

D. Submit updated schedule with each Application for Payment.

3.04 PROGRESS PHOTOGRAPHS

A. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.

B. Photography Type: Digital; electronic files.

C. Provide photographs of site and construction throughout progress of Work produced by an experienced photographer, acceptable to Architect.

3.05 DOCUMENTATION OF DETERIORATED EXISTING CONDITIONS

A. Before beginning operations on the site, record and document existing conditions that will not be corrected as part of the project and that will remain after the project is completed and that are damaged, soiled, deteriorated, or are otherwise incompatible with the quality expected of the completed work. Submit photographs and brief descriptions of each such condition.

3.06 SUBMITTALS FOR REVIEW

A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product. Major products are the primary product(s) specified in each specification section.
   1. Submit within 15 days after date of Agreement.

2. For products specified only by reference standards, list applicable reference standards.

B. Proposed Subcontractors List:
   1. Submit list of subcontractors proposed and identify the portion of work assigned to each.
   2. Submit installer qualifications specified in respective specification sections.
   3. Submit within 15 days after date of bid opening.

C. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

D. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

E. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

F. When the following are specified in individual sections, submit them for review:
   1. Product data.
   2. Shop drawings.
   3. Samples for selection.
   4. Samples for verification.
   5. Other types indicated in respective specification sections.

G. Submit to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents. Architect's review is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of any construction means, methods, techniques, sequences or procedures. Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

H. Contractor is responsible for determining and verifying materials, field measurements and field construction criteria related thereto, and checking and coordinating the information contained within the submittal with the requirements of the Work and of the Contract Documents.

I. Samples will be reviewed only for aesthetic, color, or finish selection.

3.07 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
   1. Design data.
   2. LEED submittals and reports.
   3. Certificates.
   4. Test reports.
   5. Inspection reports.
   6. Manufacturer's instructions.
   7. Manufacturer's field reports.
   8. Other types indicated in respective specification sections.

B. Submit for Architect's knowledge as contract administrator or for Owner.

C. Action taken by the Architect ("approval" or other action) indicates only that the item has been received in the form required by the contract documents and that the Architect will transmit the item to the Owner for the Owner's records, but does not indicate that the Architect has verified the accuracy or adequacy of the contents of the submittal.

3.08 SUBMITTALS FOR PROJECT CLOSEOUT

A. When the following are specified in individual sections, submit them at project closeout:
   1. Project record documents.
   2. Operation and maintenance data.
   3. Warranties.
   4. Bonds.
   5. Other types as indicated.

B. Submit for Owner's benefit during and after project completion.

C. Action taken by the Architect ("approval" or other action) indicates only that the item has been received in the form required by the contract documents and that the Architect will transmit the item to the Owner for the Owner's records, but does not indicate that the Architect has verified the accuracy or adequacy of the contents of the submittal.

3.09 TIMING AND PACKAGING OF SUBMITTALS

A. Submit complete, coordinated data. Partial submittals are not acceptable unless specifically exempted. For complex assemblies, submit data for all elements of the assembly as a single, coordinated package.

B. Initial Product Information: Submit the initial product information listed below for each Section of the Specifications as a single package, prior to placing final purchase order.
   1. Product data.
   2. Samples.
   3. Installer and manufacturer qualifications.
   4. Manufacturer's instructions.
   5. Certificates, test reports, and inspection reports of standard plant runs that demonstrate compliance of proposed products with specified quality.
   6. Similar submittals demonstrating quality of proposed products.

C. Shop Drawings and Design Data: Submit each Section of the Specifications as a single package, except that especially large quantities of drawings on large projects may be divided into individual submissions, such as package 1, 2, 3, etc. Submit the following prior to placing final order for fabrication.
   1. Detailed drawings prepared specifically for the project, for example drawings of concrete reinforcing, structural steel, curtain wall.
   2. Calculations or other designs prepared specifically for the project.

D. In-Progress Reports: Multiple submittals permitted. Submit the following in a timely manner as the work progresses.
   1. Certificates, test reports, and inspection reports of actual plant runs for this project (where required) or of tests and inspections made at the project site (earthwork, concrete, steel, etc.).
   2. Similar submittals recording actual quality installed on-site.

E. Closeout Submittals: Submit the following for each Section of the Specifications as a single package:
   1. Final certificates, test reports, and inspection reports of completed work.

2. Project record documents.
3. Operation and maintenance data.
4. Warranties and bonds.
5. Similar submittals attesting to completed work.

3.10 NUMBER OF COPIES OF SUBMITTALS

A. Initial Product Information, Shop Drawings, Design Data, and In-Progress Reports:
   1. Small Size Sheets, 8-1/2 x 11 or 11 x 14 inches (do not submit 8-1/2 x 14): Submit one copy; the Contractor shall make his own copies from original returned by the Architect after making his own file copy.
   2. Large Sheets: Submit one reproducible transparency and one opaque reproduction.

B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect. If not specified in individual specification sections, submit two.
   1. After review, produce duplicates.
   2. Retained samples will not be returned to Contractor unless specifically so stated.

C. Documents for Project Closeout:
   1. Warranties, Bonds, and Executed Forms: Submit executed original to the Architect who will transmit original to the Owner.
   2. Testing, Balancing, Start-Up, and Operations and Maintenance Manuals: Submit number of copies as specified in respective specification sections. If quantity is not so indicated, submit two copies.

3.11 SUBMITTAL PROCEDURES

A. Transmit each submittal with approved form.

B. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.

C. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.

D. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.

E. Deliver submittals to Architect at business address.

F. Schedule submittals to expedite the Project, and coordinate submission of related items.

G. Schedule submittals for orderly review by the Architect. For each submittal for review, allow 15 days plus delivery time to and from the Contractor, unless Architect notifies Contractor that additional time is necessary for review on account of Contractor's scheduling of simultaneous submittals.

H. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.

I. Provide space for Contractor and Architect review stamps.

J. When revised for resubmission, identify all changes made since previous submission.

K. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.

L. Submittals not requested will not be processed.

END OF SECTION

SECTION 01 4000
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. References and standards.

B. Mock-ups.

C. Control of installation.

D. Tolerances.

E. Testing and inspection services.

F. Manufacturer's field services.

1.02 REFERENCES

A. ASTM C 1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2001.

B. ASTM C 1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation; 2005b.

C. ASTM C 1093 - Standard Practice for Accreditation of Testing Agencies for Unit Masonry; 2006.

D. ASTM D 3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2004a.

E. ASTM E 329 - Standard Specification for Agencies Engaged in Construction Inspection and/or Testing; 2005b.

F. ASTM E 543 - Standard Practice for Agencies Performing Nondestructive Testing; 2004.

1.03 SUBMITTALS

A. Testing Agency Qualifications:
   1. Prior to start of Work, submit agency name, address, and telephone number, and names of full time registered engineer and responsible officer.
   2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.

B. Test Reports: After each test/inspection, promptly submit report directly to Architect and to Contractor. Include:
   1. Date issued.
   2. Project title and number.
   3. Name of inspector.
   4. Date and time of sampling or inspection.
   5. Identification of product and specifications section.
   6. Location in the Project.
   7. Type of test/inspection.
   8. Date of test/inspection.
   9. Results of test/inspection.
   10. Conformance with Contract Documents.
   11. When requested by Architect, provide interpretation of results.

C. Manufacturer's Field Reports: Submit reports for Architect's information and benefit as contract administrator.
   1. Submit reports within 7 days of observation to Architect.

1.04 REFERENCES AND STANDARDS

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard of date of issue specified in individual specification sections or, if none, the date current on the date of issue of the Contract Documents.

C. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

D. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.05 TESTING AND INSPECTION AGENCIES

A. Contractor shall employ and pay for services of an independent testing agency to perform specified testing and inspection.

B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

C. Contractor Employed Agency:
   1. Testing agency: Comply with requirements of ASTM E 329, ASTM E 548, ASTM E 543, ASTM C 1021, ASTM C 1077, ASTM C 1093, and ASTM D 3740 as applicable to the nature of the testing.
   2. Maintain a full time registered engineer on staff to review services.
   3. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have Work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 MOCK-UPS

A. Testing may be performed under provisions identified in the respective product specification sections and as otherwise directed by the Architect..

B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

C. Approved mock-ups (in conjunction with the other requirements of the Contract Documents) shall be a standard of quality for judging the Work.

D. If mock-up is specified to be removed, remove and dispose of the mock-up only after mock-up has been approved by Architect and when directed to do so.

3.03 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

3.04 TESTING AND INSPECTION

A. See individual specification sections for testing required.

B. Testing Agency Duties:
   1. Test samples of mixes submitted by Contractor.
   2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
   3. Perform specified sampling and testing of products in accordance with specified standards.
   4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
   5. Promptly notify Architect and Contractor of observed irregularities or non-conformance of Work or products.
   6. Perform additional tests and inspections required by Architect.
   7. Submit reports of all tests/inspections specified.

C. Limits on Testing/Inspection Agency Authority:
   1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
   2. Agency may not approve or accept any portion of the Work.
   3. Agency may not assume any duties of Contractor.
   4. Agency has no authority to stop the Work.

D. Contractor Responsibilities:
   1. Deliver to agency at designated location, adequate samples of materials proposed to be used which require testing, along with proposed mix designs.
   2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
   3. Provide incidental labor and facilities:
      a. To provide access to Work to be tested/inspected.
      b. To obtain and handle samples at the site or at source of Products to be tested/inspected.

c. To facilitate tests/inspections.
d. To provide storage and curing of test samples.

4. Provide reasonable notice to Architect and laboratory of expected time for operations requiring testing/inspection services to permit Architect and testing laboratory to schedule their activities.
5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

E. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect. Payment for re testing will be charged to the Contractor by deducting testing charges from the Contract Price.

3.05 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections or when requested by the Architect, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, and testing, adjusting, and balancing of equipment, and to initiate instructions when necessary.

B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.06 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not conforming to specified requirements.

B. If, in the opinion of Architect, it is not practical to remove and replace the Work, Architect will direct an appropriate remedy or adjust payment.

END OF SECTION

STATEMENT OF SPECIAL INSPECTIONS

PROJECT: FAYETTE COUNTY PUBLIC LIBRARY ADDITION

LOCATION: FAYETTEVILLE, GA

PERMIT APPLICANT: _____

APPLICANT'S ADDRESS: _____

ARCHITECT OF RECORD: LORD AECK SARGENT ARCHITECTURE

STRUCTURAL ENGINEER OF RECORD: DAVIS & CHURCH, LLC

REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE: _____

This Statement of Special Inspections is submitted in accordance with Section 1704 of the 2006 International Building Code. It includes a *Schedule of Special Inspection Services* applicable to the above-referenced Project as well as the identity of the individuals, agencies, or firms intended to be retained for conducting these inspections. If applicable, it includes *Requirements for Seismic Resistance* and/or *Requirements for Wind Resistance*.

Are *Requirements for Seismic Resistance* included in the *Statement of Special Inspections*? ☐ Yes ☒ No

Are *Requirements for Wind Resistance* included in the *Statement of Special Inspections*? ☐ Yes ☒ No

The Special Inspector(s) shall keep records of all inspections and shall furnish interim inspection reports to the Building Official and to the Registered Design Professional in Responsible Charge at a frequency agreed upon by the Design Professional and the Building Official prior to the start of work. Discrepancies shall be brought to the immediate attention of the Contractor for correction. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official and the Registered Design Professional in Responsible Charge prior to competition of that phase of work. A *Final Report of Special Inspections* documenting required special inspections and corrections of any discrepancies noted in the inspections shall be submitted to the Building Official and the Registered Design Professional in Responsible Charge at the conclusion of the project.

Frequency of interim report submittals to the Registered Design Professional in Responsible Charge:

__X__ Weekly __Bi-Weekly __X__ Monthly Other; specify:_____

The Special Inspection program does not relieve the Contractor of the responsibility to comply with the Contract Documents. Jobsite safety and means and methods of construction are solely the responsibility of the Contractor.

Statement of Special Inspections Prepared by:

Matthew S. Church, PE
Type or print name

Preparer's Seal

Building Official's Acceptance:

Signature Date

Permit Number:

Frequency of interim report submittals to the Building Official:

__Monthly __Bi- Monthly __Upon Completion

Statement of Special Inspections
Requirements for Seismic Resistance

See the Schedule of Special Inspections for inspection and testing requirements

Seismic Design Category: B

Statement of Special Inspection for Seismic Resistance Required (Yes/No): No

Description of seismic force-resisting system subject to special inspection and testing for seismic resistance:
(Required for Seismic Design Categories C, D, E or F)

N/A

Description of designated seismic systems subject to special inspection and testing for seismic resistance:
(Required for architectural, electrical and mechanical systems and their components that require design in accordance with ASCE 7-05 Chapter 13, have a component importance factor, *Ip*, greater than one and are in Seismic Design Categories D, E or F.)

None

Description of additional seismic systems and components requiring special inspections and testing:
(Required for systems noted in IBC Section 1705.3, cases 3, 4 & 5 in Seismic Design Categories C, D, E or F.)

None

Statement of Responsibility:
Each contractor responsible for the construction or fabrication of a system or component described above must submit a Statement of Responsibility.

SCHEDULE OF SPECIAL INSPECTION SERVICES

MATERIAL / ACTIVITY	SERVICE	REFERENCED STANDARD[3]	APPLICABLE TO THIS PROJECT			
			Y/N	EXTENT	AGENT*	DATE COMPLETED
1704.2 Inspection of Fabricators						
Verify fabrication/quality control procedures.	In-plant review or verification of auditing by an approved special inspection agency	IBC 1704.2	Y	Periodic		
1704.3 Steel Construction						
Material verification of high-strength bolts, nuts, and washers.	Review identification markings to conform to ASTM standards specified in approved construction documents and manufacturer's certificates of compliance	Applicable ASTM material specifications; AISC 360, Section A3.3	Y	Periodic		
Inspection of high-strength bolting:	Field inspection		Y			
a. Bearing-type connections		AISC 360, Section M2.5; IBC 1704.3.3		Periodic		
b. Pre-tensioned or slip-critical						
1) Turn-of-nut with matching markings				Periodic		
2) Direct tension indicator				Periodic		
3) Twist-off bolt				Periodic		
4) Turn-of-nut without matching markings				Continuous		
5) Calibrated wrench				Continuous		
Material verification of structural steel:			Y			
a. Identification markings to conform to ASTM standards specified in approved construction documents	Field inspection	ASTM A 6 or ASTM A 568; IBC 1708.4		Periodic		
b. Manufacturer's certified mill test reports	Review submittals			Each submittal		
Weld filler materials.	Review certificate of compliance and field verification	AISC 360, Section A3.5	Y	Periodic and each submittal		

SCHEDULE OF SPECIAL INSPECTION SERVICES

MATERIAL / ACTIVITY	SERVICE	REFERENCED STANDARD[3]	APPLICABLE TO THIS PROJECT			
			Y/N	EXTENT	AGENT*	DATE COMPLETED
Structural steel welding:	Shop and field inspection	AWS D1.1; IBC 1704.3.1	Y			
a. Complete and partial penetration groove welds				Continuous		
b. Multi-pass fillet welds				Continuous		
c. Single-pass fillet welds > 5/16"				Continuous		
d. Single-pass fillet welds ≤ 5/16"				Periodic		
e. Floor and deck welds		AWS D1.3		Periodic		
Reinforcing steel welding:	Shop and field inspection	AWS D1.4; ACI 318: 3.5.2	N			
a. Verification of weldability of steel other than ASTM A 706				Periodic		
b. Reinforcing steel-resisting flexural and axial forces in intermediate and special moment frames, and boundary elements of special concrete shear walls, and shear reinforcement				Continuous		
c. Shear reinforcement				Continuous		
d. Other reinforcing steel				Periodic		
Inspection of steel frame joint details for compliance with approved construction documents.	Field inspection	IBC 1704.3.2	Y			
a. Details such as bracing & stiffening				Periodic		
b. Member locations				Periodic		
c. Application of joint details at each connection				Periodic		
1704.4 Concrete Construction						
Inspection of reinforcing steel installation.	Field inspection	ACI 318: 3.5, 7.1-7.7; IBC 1913.4	Y	Periodic.		
Inspection of prestressing steel installation.	In-plant or field review		N	Periodic		
Inspection of prestressed concrete:	In-plant or field review		N			
a. Application of prestressing force		ACI 318: 18.20		Continuous		
b. Grouting of bonded prestressing tendons in the seismic-force-resisting system		ACI 318: 18.18.4		Continuous		

SCHEDULE OF SPECIAL INSPECTION SERVICES

MATERIAL / ACTIVITY	SERVICE	REFERENCED STANDARD[3]	APPLICABLE TO THIS PROJECT			
			Y/N	EXTENT	AGENT*	DATE COMPLETED
Inspection of cast-in-place bolts prior to and during placement of concrete	Field inspection	IBC 1911.5	Y	Continuous		
Verification of required design mix.	Review submittals	ACI 318: Ch 4, 5.2-5.4; IBC 1904.2.2, 1913.2, 1913.3	Y	Periodic		
At fresh concrete sampling to fabricate specimens for strength tests, perform slump and air content tests, and determine concrete temperature .	Field testing	ASTM C 172; ASTM C 31; ACI 318: 5.6, 5.8; IBC 1913.10	Y	Continuous		
Inspection of concrete and shotcrete placement for proper application techniques	Field review	ACI 318: 5.9, 5.10; IBC 1913.6, 1913.7, 1913.8	Y	Continuous		
Concrete curing operations.	Field review	ACI 318: 5.11-5.13; IBC 1913.9	Y	Periodic		
Erection of precast concrete members.	Field review	ACI 318: Ch 16	N	Periodic		
Evaluation of concrete strength.	Field testing and review of laboratory reports	ACI 318: 5.6	Y	Periodic		
Verification of in-situ concrete strength, prior to stressing of tendons in post tensioned concrete and prior to removal of shores and forms from beams and structural slabs.	Review field testing and laboratory reports	ACI 318: 6.2	N	Periodic		
Inspection of formwork for shape, lines, location and dimensions	Field inspection	ACI 318: 6.1.1	Y	Periodic		
1704.5 Masonry Construction (Level 1 Special Inspection)						
As masonry construction begins, verify the following to ensure compliance with the approved construction documents and referenced standards:						
a. Proportions of site-prepared mortar.	Field and submittal review	ACI 530.1/ASCE 6/TMS 602: Art. 2.6A	Y	Periodic		
b. Construction of mortar joints.	Field inspection	ACI 530.1/ASCE 6/TMS 602: Art. 3.3B	Y	Periodic		
c. Location of reinforcement, connectors, prestressing tendons and anchorages.	Field inspection	ACI 530.1/ASCE 6/TMS 602: Art. 3.4, 3.6A	Y	Periodic		
d. Prestressing technique	Field inspection	ACI 530.1/ASCE 6/TMS 602: Art. 3.6B	N	Periodic		
e. Grade and size of prestressing tendons and anchorages.	Field inspection	ACI 530.1/ASCE 6/TMS 602: Art. 2.4B, 2.4H	N	Periodic		

SCHEDULE OF SPECIAL INSPECTION SERVICES

MATERIAL / ACTIVITY	SERVICE	REFERENCED STANDARD[3]	APPLICABLE TO THIS PROJECT			
			Y/N	EXTENT	AGENT*	DATE COMPLETED
1704.5 Masonry Construction (Level 1 Special Inspection) Cont'd						
The inspection program shall verify:						
a. Size and location of structural elements.	Field and submittal review	ACI 530.1/ASCE 6/TMS 602: Art. 3.3G	Y	Periodic		
b. Type, size, and location of anchors, including details of anchorage of masonry to structural members, frames, or other construction.	Field inspection	ACI 530/ASCE 5/TMS 402: Sec. 1.2.2(e), 2.1.4, 3.1.6	Y	Periodic		
c. Size, grade, and type of reinforcement.	Field inspection	ACI 530/ASCE 5/TMS 402: Sec. 1.13; ACI 530.1/ASCE 6/TMS 602: Art. 2.4, 3.4	Y	Periodic		
d. Welding of reinforcing bars.	Field inspection	ACI 530/ASCE 5/TMS 402: Sec. 2.1.10.7.2, 3.3.3.4(b)	N	Continuous		
e. Protection of masonry during hot (above 90 ˚F) or cold (below 40 ˚ F) weather.	Field inspection	IBC 2104.3, 2104.4; ACI 530.1/ASCE 6/TMS 602: Art. 1.8C, 1.8D	Y	Periodic		
f. Application and measurement of prestressing force	Field inspection	ACI 530.1/ASCE 6/TMS 602: Art. 3.6B	N	Continuous		
Prior to grouting, verify the following to ensure compliance with the approved construction documents and referenced standards:						
a. Grout space is clean.	Field inspection	ACI 530.1/ASCE 6/TMS 602: Art. 3.2D	Y	Continuous		
b. Placement of reinforcement and connectors and prestressing tendons and anchorages.	Field inspection	ACI 530/ASCE 5/TMS 402: Sec. 1.13; ACI 530.1/ASCE 6/TMS 602: Art. 3.4	Y	Continuous		
c. Proportions of site-prepared grout and prestressing grout for bonded tendons.	Field inspection	ACI 530.1/ASCE 6/TMS 602: Art. 2.6B	Y	Continuous		
d. Construction of mortar joints.	Field inspection	ACI 530.1/ASCE 6/TMS 602: Art. 3.3B	Y	Periodic		
Verify grout placement complies with code and construction document provisions.	Field inspection	ACI 530.1/ASCE 6/TMS 602: Art. 3.5	Y	Continuous		
Verify grouting of prestressing tendons complies with code and construction document provisions.	Field inspection	ACI 530.1/ASCE 6/TMS 602: Art. 3.6C	N	Continuous		
Observe preparation of grout specimens, mortar specimens, and/or prisms.	Field inspection	IBC 2105.2.2, 2105.3; ACI 530.1/ASCE 6/TMS 602: Art. 1.4	Y	Continuous		
Verify compliance with required inspection provisions of construction documents and the approved submittals.	Field inspection	ACI 530.1/ASCE 6/TMS 602: Art. 1.5	Y	Periodic		

SCHEDULE OF SPECIAL INSPECTION SERVICES

MATERIAL / ACTIVITY	SERVICE	REFERENCED STANDARD[3]	APPLICABLE TO THIS PROJECT			
			Y/N	EXTENT	AGENT*	DATE COMPLETED
1704.6 Wood Construction						
Inspection of the fabrication process of wood structural elements and assemblies in accordance with Section 1704.2	In-plant review	IBC 1704.2	N	Periodic		
Verify species, size, spacing and alignment of stud framing with the stud schedule in the approved construction documents.	Field inspection	IBC 2306.2	N	Periodic		
Verify all wood framing and structural panel sheathing at all exterior walls are fire-retardant treated lumber.	Field inspection		N	Periodic		
Verify details in floor cavity at shear walls are in accordance with approved construction documents.	Field inspection	Diaphragms and Shear Walls Design/Construction Guide, Form L350, 2007 APA	N	Periodic		
Verify details at balcony framing are in accordance with approved construction documents.	Field inspection		N	Periodic		
Verify size, connections and location of shear wall end anchorage agree with approved construction documents.	Field inspection	IBC 2305.3.7, 2305.3.8.2.3 thru 2305.3.8.2.8	N	Periodic		
For gypsum shear walls, verify spacing of fasteners, sheathing thickness & sill plate anchorage are in accordance with approved construction documents.	Field inspection	IBC 2306.4.5 & Table 2306.4.5	N	Periodic		
For structural panel diaphragms and shear walls, verification of grade and thickness of structural panel sheathing are in accordance with approved construction documents.	Field inspection	IBC 1704.6.1, 2305.2 & 3, 2306.3 & 4 and Tables 2306.3.1 & 2 and 2306.4.1; APA ICC ES Legacy Report ER-1952; Diaphragms and Shear Walls Design/Construction Guide, Form L350, 2007 APA	N	Periodic		
For structural panel diaphragms and shear walls, verify nominal size of framing members at adjoining panel edges, nail or staple diameter and length, number of fastener lines, sill plate anchorage, and that spacing between fasteners in each line and at edge margins agrees with approved construction documents.	Field inspection		N	Periodic		

SCHEDULE OF SPECIAL INSPECTION SERVICES

MATERIAL / ACTIVITY	SERVICE	REFERENCED STANDARD[3]	APPLICABLE TO THIS PROJECT			
			Y/N	EXTENT	AGENT*	DATE COMPLETED
1704.7 Soils						
Verify materials below shallow foundations are adequate to achieve the design bearing capacity.	Field inspection	IBC 1804	Y	Periodic		
Verify excavations are extended to proper depth and have reached proper material.	Field inspection	IBC 1805.2	Y	Periodic		
Perform classification and testing of controlled fill materials.	Field inspection	IBC 1802.3, 1802.4	Y	Periodic		
Verify use of proper materials, densities, and lift thicknesses during placement and compaction of controlled fill	Field inspection	IBC 1803.5	Y	Continuous		
Prior to placement of controlled fill, observe subgrade and verify that site preparation complies with approved soils report.	Field inspection	IBC 1803.3	Y	Periodic		
Verify dry-density of compacted fill complies with approved soils report.	Review field testing		Y	Periodic		
1704.8 Pile Foundations						
Verify pile materials, sizes and lengths comply with requirements.	Field inspection and submittal review.	IBC 1808-1811	N	Continuous		
Verify capacities of test piles and conduct additional load tests, as required.	Field inspection and submittal review.	IBC 1808.2.8.1, 1808.2.8.3 - 1808.2.8.8	N	Continuous		
Observe pile driving operations and maintain complete and accurate records for each pile.	Field inspection and submittal review. Submittal to the bldg official of the results of pile load tests.	IBC 1808.2.8.2	N	Continuous		
1704.8 Pile Foundations Cont'd						
Verify placement locations and plumbness, confirm type and size of hammer, record number of blows per foot of penetration, verify required penetrations to achieve design capacity, record tip and butt elevations, and document any pile damage.	Field inspection and submittal review	IBC 1808-1811	N	Continuous		

SCHEDULE OF SPECIAL INSPECTION SERVICES

MATERIAL / ACTIVITY	SERVICE	REFERENCED STANDARD[3]	APPLICABLE TO THIS PROJECT			
			Y/N	EXTENT	AGENT*	DATE COMPLETED
For steel piles, perform additional inspections per Section 1704.3	See Section 1704.3	IBC 1809.3	N	See Section 1704.3		
For concrete piles and concrete-filled piles, perform additional inspections per Section 1704.4.	See Section 1704.4	IBC 1809.2, 1810	N	See Section 1704.4		
For specialty piles, perform additional inspections as determined by the registered design professional in responsible charge.	Field inspection	IBC 1811	N	Periodic or Continuous		
For augered uncased piles and caisson piles, perform inspections per Section 1704.9.	See Section 1704.9	IBC 1810	N	See Section 1704.9		
1704.9 Pier Foundations						
Observe drilling operations and verify that complete and accurate records are maintained for each pier.	Field inspection and submittal review.	IBC 1808, 1812	N	Continuous		
Verify placement locations and plumbness, confirm pier diameters, bell diameters (if applicable), lengths, embedment into bedrock (if applicable), and adequate end bearing strata capacity.	Field inspection and submittal review.		N	Continuous		
For concrete piers, perform additional inspections per Section 1704.4.	See Section 1704.4	IBC 1812.8	N	See Section 1704.4		
For masonry piers, perform additional inspections per Section 1704.5.	See Section 1704.5	IBC 1812.7	N	See Section 1704.5		
1704.10 Sprayed Fire-resistant Materials						
Verify surface condition preparation of structural members.	Field inspection	IBC 1704.10.1		Periodic		
Verify application of sprayed fire-resistant materials.	Field inspection	IBC 1704.10.2		Periodic		
Verify average thickness of sprayed fire-resistant materials applied to structural members.	Field inspection	IBC 1704.10.3		Periodic		
Verify density of the sprayed fire-resistant material complies with approved fire-resistant design.	Field inspection and submittal review	IBC 1704.10.4		Periodic		
Verify the cohesive/adhesive bond strength of the cured sprayed fire-resistant material.	Field inspection and submittal review	IBC 1704.10.5		Per IBC section 1704.11.5		

SCHEDULE OF SPECIAL INSPECTION SERVICES

MATERIAL / ACTIVITY	SERVICE	REFERENCED STANDARD[3]	APPLICABLE TO THIS PROJECT			
			Y/N	EXTENT	AGENT*	DATE COMPLETED
1704.11 Mastic and Intumescent Fire-Resistant Coatings						
Inspect mastic and intumescent fire-resistant coatings applied to structural elements and decks, in accordance with AWCI 12-B.	Field inspection			Periodic		
1704.12 Exterior Insulation and Finish Systems (EIFS)						
Inspect EIFS applications.	Field inspection			Periodic		
1704.13 Special Cases (work unusual in nature, including but not limited to alternative construction materials, unusual design applications, systems or materials with special manufacturer requirements. Attach 8 1/2x11 if needed).	Submittal review, shop inspection and/or field inspection.					
1704.14 Smoke Control Systems						
Leakage testing and recording of device locations prior to concealment.	Field testing			Periodic		
Prior to occupancy and after sufficient completion, pressure difference testing, flow measurements, and detection and control verification.	Field testing			Periodic		
1707.2 Structural Steel Special Inspections for Seismic Resistance			N			
Continuous inspection of structural welding except for single pass welds not exceeding 5/16" and floor and roof deck welding.	Shop and field inspection	AISC 341, Seismic Provisions	N	Continuous		
1707.3 Structural Wood Special Inspections for Seismic Resistance						
Inspection of field gluing operations of elements of the seismic-force resisting system.	Field inspection		N	Continuous		
Inspection of nailing, bolting, anchoring and other fastening of components within the seismic-force-resisting system, including wood shear walls, wood diaphragms, drag struts, braces, shear panels and hold-downs.	Shop and field inspection		N	Periodic		

SCHEDULE OF SPECIAL INSPECTION SERVICES

MATERIAL / ACTIVITY	SERVICE	REFERENCED STANDARD[3]	APPLICABLE TO THIS PROJECT			
			Y/N	EXTENT	AGENT*	DATE COMPLETED
1707.4 Cold-formed Steel Framing Special Inspections for Seismic Resistance						
Inspection during welding operations of elements of the seismic-force-resisting system.	Shop and field inspection		N	Periodic		
Inspections for screw attachment, bolting, anchoring and other fastening of components within the seismic-force-resisting system, including struts, braces and hold-downs.	Shop and field inspection		N	Periodic		
1707.5 Pier Foundations Special Inspections for Seismic Resistance						
Inspection during placement of reinforcing.	Field inspection		N	Periodic		
Inspection during placement of concrete.	Field inspection		N	Continuous		
1707.6 Storage Racks and Access Floors Special Inspections for Seismic Resistance						
Inspection during the anchorage of access floors and storage racks 8 feet or greater in height.	Field inspection		N	Periodic		
1707.7 Architectural Components Special Inspections for Seismic Resistance						
Inspection during the erection and fastening of exterior cladding and interior and exterior veneer.	Field inspection		N	Periodic		
Inspection during the erection and fastening of interior and exterior non load bearing walls.	Field inspection		N	Periodic		

SCHEDULE OF SPECIAL INSPECTION SERVICES

MATERIAL / ACTIVITY	SERVICE	REFERENCED STANDARD[3]	APPLICABLE TO THIS PROJECT			
			Y/N	EXTENT	AGENT*	DATE COMPLETED
1707.8 Mechanical and Electrical Components Special Inspections for Seismic Resistance						
Inspection during the anchorage of electrical equipment for emergency or standby power systems.	Field inspection		N	Periodic		
Inspection during the anchorage of other electrical equipment.	Field inspection		N	Periodic		
Inspection during installation of piping systems intended to carry flammable, combustible, or highly toxic contents and their associated mechanical units.	Field inspection		N	Periodic		
Inspection during the installation of HVAC ductwork that will contain hazardous materials	Field inspection		N	Periodic		
Inspection during the installation of vibration isolation systems.	Field inspection		N	Periodic		
1707.9 Designated Seismic System Verification						
Inspect and verify that that the component label, anchorage or mounting conforms to the certificate of compliance in accordance with 1708.5.	Field inspection		N	Periodic		
1707.10 Seismic Isolation System						
Inspection during the fabrication and installation of isolator units and energy dissipation devices used as part of the seismic isolation system.	Shop and field inspection		N	Periodic		
1708.1 Masonry Testing and Verification for Seismic Resistance						
Certificates of compliance used in masonry construction	Review submittals		N	Each submittal		
Verification of f'_m and f'_{AAC} prior to construction	Review submittals and field testing		N	Periodic		
Verification of f'_m and f'_{AAC} every 5000 SF during construction	Review submittals and field testing		N	Periodic		
Verification of proportions of materials in mortar and grout as delivered to the site	Field review		N	Periodic		

SCHEDULE OF SPECIAL INSPECTION SERVICES

MATERIAL / ACTIVITY	SERVICE	REFERENCED STANDARD[3]	APPLICABLE TO THIS PROJECT			
			Y/N	EXTENT	AGENT*	DATE COMPLETED
1708.3 Reinforcing and Prestressing Steel Testing for Seismic Resistance						
Review certified mill test reports for each shipment of reinforcing steel	Field review		N	Each submittal		
Verify the testing requirements of ACI 318 are met.	Shop and field inspection	ACI 318	N	Per ACI 318		
Verify reinforcing steel weldability	Review testing reports	ACI 318: 3.5.2	N	Each submittal		
1708.4 Structural Steel Testing for Seismic Resistance						
Test in accordance with the quality assurance requirements of AISC 341, Seismic Provisions	Shop and field testing		N	Each occurrence		
Acceptance criteria for non-destructive testing shall be as required in AWS D1.1.	Shop and field testing	AWS D1.1	N	Each occurrence		
Ultrasonically test for discontinuities behind and adjacent to welds after joint completion with base metal thicker than 1.5 inches where subject to through-thickness weld shrinkage strains.	Shop and field testing	ASTM A 435 or ASTM A 898 (Level 1 criteria)	N	Each occurrence		
1708.5 Seismic Qualification of Mechanical and Electrical Equipment						
Review certificate of compliance for designated seismic system components	Certificate of compliance review		N	Each submittal		
1708.5 Seismicly Isolated Structures						
Test seismic isolation system in accordance with ASCE 7 Section 17.8	Prototype testing	ASCE 7: 17.8	N	Per ASCE 7		

SCHEDULE OF SPECIAL INSPECTION SERVICES

MATERIAL / ACTIVITY	SERVICE	REFERENCED STANDARD[3]	APPLICABLE TO THIS PROJECT			
			Y/N	EXTENT	AGENT*	DATE COMPLETED

INSPECTION AGENTS	FIRM	ADDRESS	TELEPHONE NO.
1.			
2.			
3.			
4.			
5.			
6.			

Notes: 1. The inspection and testing agent(s) shall be engaged by the Owner or the Owner's Agent, and not by the Contractor or Subcontractor whose work is to be inspected or tested. Any conflict of interest must be disclosed to the Building Official prior to commencing work. The qualifications of the Special Inspector(s) and/or testing agencies may be subject to the approval of the Building Official and/or the Design Professional.

2. The list of Special Inspectors may be submitted as a separate document, if noted so above.

3. See IBC Chapter 35 for the specific standards referenced.

Encircle "Yes" or "No" as appropriate and date this document below:

Are *Requirements for Seismic Resistance* included in the *Statement of Special Inspections*? **No**

Are *Requirements for Wind Resistance* included in the *Statement of Special Inspections*? **No**

DATE: 10/22/2010

SECTION 01 4300
EXTERIOR WALL MOCK-UP

PART 1 GENERAL

1.01 MOCK-UPS

A. Construct a free-standing mock-up of the exterior wall on separate, independent foundation. Size and configuration as illustrated on the Drawings.

B. Construct a complete exterior wall assembly including foundation, back-up, weather and thermal protection, exterior cladding, openings, anchorage devices, flashings, seals, and finishes.

C. Include a portion of the mock-up that is "layered" so as to expose to view the various components such as back-up, weather and thermal protection, exterior cladding, opening details, anchorage devices, flashings, seals, and finishes.

D. Tests may be performed as identified in the respective product specification sections and as otherwise directed by the Architect.

E. Approved mock-ups (in conjunction with the other requirements of the Contract Documents) shall be a standard of quality for judging the Work.

F. Remove mock-up and clear the area only when all of the following have been satisfied: 1) When mock-up has been accepted by Architect, 2) the date of Substantial completion has passed (unless waived by the Architect or Owner), and 3) Architect directs in writing to remove mock-up.

1.02 SCHEDULING

A. Provide notice to the Architect of the anticipated starting and ending times and dates when each material included in the mock-up will be constructed, so that the Architect may observe the installation of such materials prior to covering with subsequent materials.

B. Schedule construction of the entire mock-up to occur over a period not exceeding 2 weeks, foundations excluded, unless otherwise approved by the Architect.

PART 2 PRODUCTS

2.01 MATERIALS

A. As specified in respective specification sections.

PART 3 EXECUTION

3.01 CONSTRUCTION

A. As specified in respective specification sections, and in accordance with the typical details illustrated for permanent work.

END OF SECTION

SECTION 01 5000
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary utilities.

B. Temporary sanitary facilities.

C. Temporary closures.

D. Temporary security.

E. Temporary field offices.

1.02 TEMPORARY UTILITIES

A. Provide all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes. Existing facilities may be used. The Owner will pay for utility charges for existing service.

1.03 TEMPORARY SANITARY FACILITIES

A. Provide and maintain temporary toilets. Provide at time of project mobilization.

B. Maintain daily in clean and sanitary condition.

1.04 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.

C. Protect the vehicles of others, stored materials, site, and structures from damage.

1.05 FENCING

A. Construction: Commercial grade chain link fence.

1.06 EXTERIOR ENCLOSURES

A. Provide temporary insulated 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.

1.07 INTERIOR ENCLOSURES

A. Provide temporary partitions and ceilings as indicated to separate work areas from Owner-occupied areas, to prevent penetration of dust and moisture into Owner-occupied areas, and to prevent damage to existing materials and equipment.

B. Construction: Framing and reinforced polyethylene sheet materials with closed joints and sealed edges at intersections with existing surfaces:

1.08 SECURITY

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

B. Coordinate with Owner's security program.

1.09 VEHICULAR ACCESS AND PARKING

A. Coordinate access and haul routes with governing authorities and Owner.

B. Provide and maintain access to fire hydrants, free of obstructions.

C. Provide means of removing mud from vehicle wheels before entering streets.

D. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

1.10 FIELD OFFICES

A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack and drawing display table.

B. Locate offices a minimum distance of 30 feet from existing and new structures.

C. Provide space for Project meetings, with table and chairs to accommodate 6 persons.

1.11 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Substantial Completion inspection.

B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore existing facilities used during construction to original condition.

E. Restore new permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 5721
INDOOR AIR QUALITY CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Construction procedures to promote adequate indoor air quality after construction.

B. Building flush-out after construction and before occupancy.

C. Testing indoor air quality before commencement of construction; existing building areas only.

D. Testing indoor air quality after completion of construction.

1.02 PROJECT GOALS

A. Dust and Airborne Particulates: Prevent deposition of dust and other particulates in HVAC ducts and equipment.
   1. Cleaning of ductwork is not contemplated under this Contract.
   2. Contractor shall bear the cost of cleaning required due to failure to protect ducts and equipment from construction dust.
   3. Establish condition of existing ducts and equipment prior to start of alterations.

B. Airborne Contaminants: Procedures and products have been specified to minimize indoor air pollutants.
   1. Furnish products meeting the specifications.
   2. Avoid construction practices that could result in contamination of installed products leading to indoor air pollution.

1.03 REFERENCE STANDARDS

A. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size; 2007.

B. SMACNA (OCC) - IAQ Guideline for Occupied Buildings Under Construction; 2007.

1.04 DEFINITIONS

A. Adsorptive Materials: Gypsum board, acoustical ceiling tile and panels, carpet and carpet tile, fabrics, fibrous insulation, and other similar products.

B. Contaminants: Gases, vapors, regulated pollutants, airborne mold and mildew, and the like, as specified.

C. Particulates: Dust, dirt, and other airborne solid matter.

D. Wet Work: Concrete, plaster, coatings, and other products that emit water vapor or volatile organic compounds during installation, drying, or curing.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Indoor Air Quality Management Plan: Describe in detail measures to be taken to promote adequate indoor air quality upon completion; use SMACNA IAQ Guidelines for Occupied Buildings Under Construction as a guide.
   1. Submit not less than 60 days before enclosure of building.
   2. Identify potential sources of odor and dust.
   3. Identify construction activities likely to produce odor or dust.
   4. Identify areas of project potentially affected, especially occupied areas.
   5. Evaluate potential problems by severity and describe methods of control.

6. Describe construction ventilation to be provided, including type and duration of ventilation, use of permanent HVAC systems, types of filters and schedule for replacement of filters.
7. Describe cleaning and dust control procedures.

C. Interior Finishes Installation Schedule: Identify each interior finish that either generates odors, moisture, or vapors or is susceptible to adsorption of odors and vapors, and indicate air handling zone, sequence of application, and curing times.

D. Duct and Terminal Unit Inspection Report.

E. Air Contaminant Test Plan: Identify:
1. Testing agency qualifications.
2. Locations and scheduling of air sampling.
3. Test procedures, in detail.
4. Test instruments and apparatus.
5. Sampling methods.

F. Air Contaminant Test Reports: Show:
1. Location where each sample was taken, and time.
2. Test values for each air sample; average the values of each set of 3.
3. HVAC operating conditions.
4. Certification of test equipment calibration.
5. Other conditions or discrepancies that might have influenced results.

1.06 QUALITY ASSURANCE

A. Testing and Inspection Agency Qualifications: Independent testing agency having minimum of 5 years experience in performing the types of testing specified.

PART 2 PRODUCTS

2.01 MATERIALS

A. Low VOC Materials: See other sections for specific requirements for materials with low VOC content.

PART 3 EXECUTION

3.01 CONSTRUCTION PROCEDURES

A. Prevent the absorption of moisture and humidity by adsorptive materials by:
1. Sequencing the delivery of such materials so that they are not present in the building until wet work is completed and dry.
2. Delivery and storage of such materials in fully sealed moisture-impermeable packaging.
3. Provide sufficient ventilation for drying within reasonable time frame.

B. Begin construction ventilation when building is substantially enclosed.

C. When working in a portion of an occupied building, prevent movement of air from construction area to occupied area.

D. HVAC equipment and ductwork may NOT be used for ventilation during construction:
1. Provide temporary ventilation equivalent to 1.5 air changes per hour, minimum.
2. Exhaust directly to outside.
3. Seal HVAC air inlets and outlets immediately after duct installation.

E. Do not store construction materials or waste in mechanical or electrical rooms.

F. Prior to use of return air ductwork without intake filters clean up and remove dust and debris generated by construction activities.

1. Inspect duct intakes, return air grilles, and terminal units for dust.
2. Clean plenum spaces, including top sides of lay-in ceilings, outsides of ducts, tops of pipes and conduit.
3. Clean tops of doors and frames.
4. Clean mechanical and electrical rooms, including tops of pipes, ducts, and conduit, equipment, and supports.
5. Clean return plenums of air handling units.
6. Remove intake filters last, after cleaning is complete.

G. Do not perform dusty or dirty work after starting use of return air ducts without intake filters.

H. Use other relevant recommendations of SMACNA IAQ Guideline for Occupied Buildings Under Construction for avoiding unnecessary contamination due to construction procedures.

3.02 BUILDING FLUSH-OUT

A. Contractor's Option: Either full continuous flush-out OR satisfactory air contaminant testing is required, not both.

B. Perform building flush-out before occupancy.

C. Do not start flush-out until:
1. All construction is complete.
2. HVAC systems have been tested, adjusted, and balanced for proper operation.
3. Inspection of inside of return air ducts and terminal units confirms that cleaning is not necessary.
4. New HVAC filtration media have been installed.

D. Building Flush-Out: Operate all ventilation systems at normal flow rates with 100 percent outside air until a total air volume of 14,000 cubic feet per square foot of floor area has been supplied.
1. Obtain Owner's concurrence that construction is complete enough before beginning flush-out.
2. Maintain interior temperature of at least 60 degrees F and interior relative humidity no higher than 60 percent.
3. If additional construction involving materials that produce particulates or any of the specified contaminants is conducted during flush-out, start flush-out over.
4. If interior spaces must be occupied prior to completion of the flush-out, supply a minimum of 25 percent of the total air volume prior to occupancy, and:
   a. Begin ventilation at least three hours prior to daily occupancy.
   b. Continue ventilation during all occupied periods.
   c. Provide minimum outside air volume of 0.30 cfm per square foot or design minimum outside air rate, whichever is greater.

E. Install new HVAC filtration media after completion of flush-out and before occupancy or further testing.

3.03 AIR CONTAMINANT TESTING

A. Contractor's Option: Either full continuous flush-out OR satisfactory air contaminant testing is required, not both.

B. Perform air contaminant testing before starting construction, as base line for evaluation of post-construction testing.

C. Perform air contaminant testing before occupancy.

D. Do not start air contaminant testing until:

1. All construction is complete, including interior finishes.
2. HVAC systems have been tested, adjusted, and balanced for proper operation.
3. New HVAC filtration media have been installed.

E. Indoor Air Samples: Collect from spaces representative of occupied areas:
1. Collect samples while operable windows and exterior doors are closed, HVAC system is running normally as if occupied, with design minimum outdoor air, but with the building unoccupied.
2. Collect samples from spaces in each contiguous floor area in each air handler zone, but not less than one sample per 25,000 square feet; take samples from areas having the least ventilation and those having the greatest presumed source strength.
3. Collect samples from height from 36 inches to 72 inches above floor.
4. Collect samples from same locations on 3 consecutive days during normal business hours; average the results of each set of 3 samples.
5. Exception: Areas with normal very high outside air ventilation rates, such as laboratories, do not need to be tested.
6. When retesting the same building areas, take samples from at least the same locations as in first test.

F. Outdoor Air Samples: Collect samples at outside air intake of each air handler at the same time as indoor samples are taken.

G. Analyze air samples and submit report.

H. Air Contaminant Concentration Determination and Limits:
1. Carbon Monoxide: Not more than 9 parts per million and not more than 2 parts per million higher than outdoor air.
2. Airborne Mold and Mildew: Measure in relation to outside air ; not higher than outside air.
3. Formaldehyde: Not more than 50 parts per billion.
4. Formaldehyde: Measure in micrograms per cubic meter, in relation to outside air ; not more than 20 micrograms per cubic meter higher than outside air.
5. Total Volatile Organic Compounds (TVOC): Not more than 500 micrograms per cubic meter.
6. Total Volatile Organic Compounds (TVOC): Measure in micrograms per cubic meter, in relation to outside air ; not more than 200 micrograms per cubic meter higher than outside air.
7. Particulates (PM10): Not more than 50 micrograms per cubic meter.
8. Total Particulates (PM): Measure in micrograms per cubic meter, in relation to outside air ; not more than 20 micrograms per cubic meter higher than outside air.

END OF SECTION

SECTION 01 5813
TEMPORARY PROJECT SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project identification sign.

B. Project informational signs.

1.02 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: Responsibility to provide signs.

1.03 REFERENCE STANDARDS

A. FHWA (SHS) - Standard Highway Signs; Federal Highway Administration, U.S. Department of Transportation; 2004.

1.04 QUALITY ASSURANCE

A. Design sign and structure to withstand 50 miles/hr wind velocity.

B. Sign Painter: Experienced as a professional sign painter for minimum three years.

C. Finishes, Painting: Adequate to withstand weathering, fading, and chipping for duration of construction.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Shop Drawing: Show content, layout, lettering, color , foundation , structure , sizes and grades of members.

PART 2 PRODUCTS

2.01 SIGN MATERIALS

A. Structure and Framing: New, wood, structurally adequate.

B. Sign Surfaces: Exterior grade plywood with medium density overlay, minimum 3/4 inch thick, standard large sizes to minimize joints.

C. Rough Hardware: Galvanized.

D. Paint and Primers: Exterior quality, two coats; sign background of White color.

E. Lettering: Exterior quality paint, contrasting colors.

2.02 PROJECT IDENTIFICATION SIGN

A. One painted sign of construction, design, and content shown on Drawings, location designated.

B. Content:

1. Project number, title, logo and name of Owner as indicated on Contract Documents.
2. Names and titles of authorities.
3. Names and titles of Architect and Consultants.
4. Name of Prime Contractor and major Subcontractors.

C. Graphic Design, Colors, Style of Lettering: Designated by Architect.

2.03 PROJECT INFORMATIONAL SIGNS

A. Painted informational signs of same colors and lettering as Project Identification sign, or standard products; size lettering to provide legibility at 100 foot distance.

B. Provide at each field office, storage shed , and directional signs to direct traffic into and within site. Relocate as Work progress requires.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install project identification sign within 30 days after date fixed by Notice to Proceed.

B. Erect supports and framing on secure foundation, rigidly braced and framed to resist wind loadings.

C. Install sign surface plumb and level, with butt joints. Anchor securely.

3.02 MAINTENANCE

A. Maintain signs and supports clean, repair deterioration and damage.

3.03 REMOVAL

A. Remove signs, framing, supports, and foundations at completion of Project and restore the area.

END OF SECTION

SECTION 01 6000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General product requirements.

B. Prohibition of asbestos-containing materials.

C. Re-use of existing products.

D. Storage and protection.

E. Product option requirements.

F. Substitution requirements and procedures.

G. Spare parts and maintenance materials.

1.02 RELATED SECTIONS

A. Instructions to Bidders and General Conditions: Product options and substitution procedures.

B. Section 01 6201 - Pre-Bid Substitution Request.

C. Section 01 6202 - Post-Bid Substitution Request.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by the Contract Documents.

B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.

C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.

2.02 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by the Contract Documents.

B. Do not use products that contain 1 percent or more by weight of asbestos (asbestiform varieties of chrysotile (serpentine), crocidolite (riebeckite), amosite (cummingtonite-grunerite), anthophyllite, tremolite, or actinolite)) .

2.03 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description, and comply with the remaining requirements of the project.

B. Products Specified by Naming One or More Brand Name Products (or Manufacturers): Use one of the brand name products specified (or product of the manufacturers specified), and comply with the remaining requirements of the project.

2.04 SPARE PARTS AND MAINTENANCE PRODUCTS

A. Provide spare parts, maintenance, and extra products of types and in quantities specified in individual specification sections.

B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION PROCEDURES

A. For time restrictions on substitution requests see the Invitation to Bidders and the General Conditions.

B. Approval of substitutions after the award of contract may occur only by Contract Modification.

C. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals without separate written request complying with the requirements specified herein.

D. Substitution Submittal Procedure:
   1. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.
   2. Accompany requests during the bidding period with a completed Pre-Bid Substitution Request as specified in Section 01 6201.
   3. Accompany requests after the award of contract with a completed Post-Bid Substitution Request as specified in Section 01 6202.
   4. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
   5. Accompany requests after the award of contract with complete documentation of cost (whether cost will increase, decrease, or remain the same) as specified in Section 01 2000 under "Substantiation of Proposed Contract Modifications".
   6. The Architect will notify Contractor in writing of decision to accept or reject request.

E. A request for substitution constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
   2. Will provide the same warranty for the substitution as for the specified product.
   3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
   4. Waives claims for additional costs or time extension which may subsequently become apparent.

3.02 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.

B. Store and protect products in accordance with manufacturers' instructions.

C. Store with seals and labels intact and legible.

D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.

G. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

H. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

I. Prevent contact with material that may cause corrosion, discoloration, or staining.

J. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

K. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 01 7000
EXECUTION REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Requirements for alterations work, including selective demolition, except removal, disposal, and/or remediation of hazardous materials and toxic substances.

C. Pre-installation meetings.

D. Cutting and patching.

E. Surveying for laying out the work.

F. Cleaning and protection.

G. Starting of systems and equipment.

H. Demonstration and instruction of Owner personnel.

1.02 SUBMITTALS

A. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
   1. On request, submit documentation verifying accuracy of survey work.
   2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in conformance with Contract Documents.
   3. Submit surveys and survey logs for the project record.

B. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.03 QUALIFICATIONS

A. For survey work, employ a land surveyor registered in the State in which the Project is located and acceptable to Architect. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.

1.04 PROJECT CONDITIONS

A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

B. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

C. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere.

D. Rodent and Pest Control: Provide methods, means, and facilities to prevent rodents and pests and insects from accessing or invading premises.

E. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations.

1.05 COORDINATION

A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements.

B. Notify affected utility companies and comply with their requirements.

C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

D. Coordinate space requirements, supports, and installation of mechanical and electrical work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

E. In finished areas, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

F. Coordinate completion and clean-up of work of separate sections.

G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

A. Notify Architect sufficiently in advance of meeting date to allow for coordination with Architect's schedule.

B. Prepare agenda and preside at meeting:
   1. Review conditions of examination, preparation and installation procedures.
   2. Review coordination with related work.

C. Record minutes and distribute copies within two days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Architect of any discrepancies discovered.

C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

D. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.

F. Utilize recognized engineering survey practices.

G. Establish a minimum of two permanent bench marks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.

H. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
   2. Grid or axis for structures.
   3. Building foundation, column locations, and ground floor elevations.

I. Periodically verify layouts by same means.

J. Maintain a complete and accurate log of control and survey work as it progresses.

K. On completion of foundation walls and major site improvements, prepare a certified survey illustrating dimensions, locations, angles, elevations of construction, and site work.

3.05 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.06 ALTERATIONS

A. Drawings showing existing construction and utilities are not record documents or precise surveys of actual conditions.
   1. Verify that construction and utility arrangements are as shown.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of alterations work constitutes acceptance of existing conditions.

B. Separate areas in which alterations are being conducted from other areas that are still occupied; provide, erect, and maintain temporary dustproof partitions of construction.

C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
   1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.

2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.

D. Remove existing work as indicated and as required to accomplish new work.
   1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
   2. Remove items indicated on drawings.
   3. Relocate items indicated on drawings.
   4. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
   5. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.

E. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
   2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
   3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
      a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
      b. Provide temporary connections as required to maintain existing systems in service.
   4. Verify that abandoned services serve only abandoned facilities.
   5. Remove abandoned pipe, ducts, conduits, and equipment , including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.

F. Protect existing work to remain.
   1. Prevent movement of structure; provide shoring and bracing if necessary.
   2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.
   4. Patch as specified for patching new work.

G. Adapt existing work to fit new work.

H. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect.

I. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.

J. Where a change of plane of 1/4 inch or more occurs in existing work, submit recommendation for providing a smooth transition for Architect review and request instructions.

K. Refinish existing surfaces as indicated:

1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.
3. Patch as specified for patching new work.

L. Clean existing systems and equipment.

M. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.

N. Do not begin new construction in alterations areas before demolition is complete.

3.07 CUTTING AND PATCHING

A. Execute cutting and patching including excavation and fill to complete the work, to uncover work in order to install improperly sequenced work, to remove and replace defective or non-conforming work, to remove samples of installed work for testing, to provide openings in the work for penetration of mechanical and electrical work, to execute patching to complement adjacent work, and to fit products together to integrate with other work.

B. Execute work by methods to avoid damage to other work, and which will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

C. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

D. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

E. Restore work with new products in accordance with requirements of Contract Documents.

F. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

G. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 8400, to full thickness of the penetrated element.

H. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

I. Make neat transitions. Patch work to match adjacent work in texture and appearance. Where new work abuts or aligns with existing, perform a smooth and even transition.

J. Patch or replace surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. Repair substrate prior to patching finish. Finish patches to produce uniform finish and texture over entire area. When finish cannot be matched, refinish entire surface to nearest intersections.

3.08 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

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.

3.09 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

G. Prohibit traffic from landscaped areas.

H. Remove protective coverings when no longer needed; reuse or recycle plastic coverings if possible.

3.10 STARTING SYSTEMS

A. Coordinate schedule for start-up of various equipment and systems.

B. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.

C. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

D. Verify that wiring and support components for equipment are complete and tested.

E. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.

F. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.11 DEMONSTRATION AND INSTRUCTION

A. Demonstrate to Owner's personnel the start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed time, at equipment location.

B. For equipment or systems requiring seasonal operation, perform demonstration for other season near the onset of the other season.

C. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of owner personnel.

D. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.

E. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

3.12 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.13 FINAL CLEANING

A. Clean areas to be occupied by Owner prior to final completion before Owner occupancy.

B. Use cleaning materials that are nonhazardous.

C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces, dust and mop hard flooring.

D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

E. Clean permanent washable filters and replace disposable filters of operating equipment.

F. Clean debris from roofs, gutters, downspouts, and drainage systems.

G. Clean site; sweep paved areas, rake clean landscaped surfaces.

H. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

END OF SECTION

SECTION 01 7390
INDOOR AIR QUALITY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Construction procedures to promote adequate indoor air quality after construction.

B. Building flush-out after construction and before occupancy.

1.02 PROJECT GOALS

A. See Section 01 3531 - LEED Building Requirements, for overall project goals relating to environment and energy.

B. Dust and Airborne Particulates: Prevent deposition of dust and other particulates in HVAC ducts and equipment.
   1. Cleaning of ductwork is not contemplated under this Contract.
   2. Contractor shall bear the cost of cleaning required due to failure to protect ducts and equipment from construction dust.

C. Airborne Contaminants: Procedures and products have been specified to minimize indoor air pollutants.
   1. Furnish products meeting the specifications.
   2. Avoid construction practices that could result in contamination of installed products leading to indoor air pollution.

1.03 REFERENCE STANDARDS

A. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size; 2007.

1.04 DEFINITIONS

A. Adsorptive Materials: Gypsum board, acoustical ceiling tile and panels, carpet and carpet tile, fabrics, fibrous insulation, and other similar products.

B. Contaminants: Gases, vapors, regulated pollutants, airborne mold and mildew, and the like, as specified.

C. Particulates: Dust, dirt, and other airborne solid matter.

D. Wet Work: Concrete, plaster, coatings, and other products that emit water vapor or volatile organic compounds during installation, drying, or curing.

1.05 SUBMITTALS

1.06 QUALITY ASSURANCE

A. Testing and Inspection Agency Qualifications: Independent testing agency having minimum of 5 years experience in performing the types of testing specified.

PART 2 PRODUCTS

2.01 MATERIALS

A. Low VOC Materials: See other sections for specific requirements for materials with low VOC content.

B. Auxiliary Air Filters: MERV of 8, minimum, when tested in accordance with ASHRAE 52.2.

PART 3 EXECUTION

3.01 CONSTRUCTION PROCEDURES

A. Prevent the absorption of moisture and humidity by adsorptive materials by:
   1. Sequencing the delivery of such materials so that they are not present in the building until wet work is completed and dry.
   2. Delivery and storage of such materials in fully sealed moisture-impermeable packaging.
   3. Provide sufficient ventilation for drying within reasonable time frame.

B. Begin construction ventilation when building is substantially enclosed.

C. If extremely dusty or dirty work must be conducted inside the building, shut down HVAC systems for the duration; remove dust and dirt completely before restarting systems.

D. When working in a portion of an occupied building, prevent movement of air from construction area to occupied area.

E. HVAC equipment and ductwork may NOT be used for ventilation during construction:
   1. Provide temporary ventilation equivalent to 1.5 air changes per hour, minimum.
   2. Exhaust directly to outside.
   3. Seal HVAC air inlets and outlets immediately after duct installation.

F. Do not store construction materials or waste in mechanical or electrical rooms.

G. Prior to use of return air ductwork without intake filters clean up and remove dust and debris generated by construction activities.
   1. Inspect duct intakes, return air grilles, and terminal units for dust.
   2. Clean plenum spaces, including top sides of lay-in ceilings, outsides of ducts, tops of pipes and conduit.
   3. Clean tops of doors and frames.
   4. Clean mechanical and electrical rooms, including tops of pipes, ducts, and conduit, equipment, and supports.
   5. Clean return plenums of air handling units.
   6. Remove intake filters last, after cleaning is complete.

H. Do not perform dusty or dirty work after starting use of return air ducts without intake filters.

I. Minimize use of all-purpose cleaners and solvents containing volatile organic compounds (VOCs), EDTA, NTA, glycol ethers, and phenolic compounds. Use of these products shall be coordinated with air contaminate testing.

J. Use other relevant recommendations of SMACNA IAQ Guideline for Occupied Buildings Under Construction for avoiding unnecessary contamination due to construction procedures.

3.02 BUILDING FLUSH-OUT

A. Contractor's Option: Either full continuous flush-out OR satisfactory air contaminant testing is required, not both.

B. Do not start flush-out until:
   1. All construction is complete.
   2. HVAC systems have been tested, adjusted, and balanced for proper operation.
   3. Inspection of inside of return air ducts and terminal units confirms that cleaning is not necessary.
   4. New HVAC filtration media have been installed.

C. Pre-Occupancy Building Flush-Out: Operate all ventilation systems at normal flow rates with 100 percent outside air until a total air volume of 14,000 cubic feet per square foot of floor area has been supplied.
   1. Obtain Owner's concurrence that construction is complete enough before beginning flush-out.

2. Maintain interior temperature of at least 60 degrees F and interior relative humidity no higher than 60 percent.
3. If additional construction involving materials that produce particulates or any of the specified contaminants is conducted during flush-out, start flush-out over.

D. Install new HVAC filtration media after completion of flush-out and before occupancy or further testing.

END OF SECTION

SECTION 01 7419

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

A. Owner requires that this project generate the least amount of trash and waste possible.

B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.

D. Required Recycling, Salvage, and Reuse: The following may not be disposed of in landfills or by incineration:
   1. Aluminum and plastic beverage containers.
   2. Corrugated cardboard.
   3. Wood pallets.
   4. Clean dimensional wood: May be used as blocking or furring.
   5. Land clearing debris, including brush, branches, logs, and stumps: See Section 31 1000 for use options.
   6. Concrete: May be crushed and used as riprap, aggregate, sub-base material, or fill.
   7. Bricks.
   8. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
   9. Glass.
   10. Gypsum drywall and plaster.
   11. Plastic buckets.
   12. Carpet, carpet cushion, carpet tile, and carpet remnants , both new and removed: DuPont (http://flooring.dupont.com) and Interface (www.interfaceinc.com) conduct reclamation programs.
   13. Asphalt roofing shingles.

E. Contractor shall submit periodic Waste Disposal Reports; all landfill disposal, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.

F. Methods of trash/waste disposal that are not acceptable are:
   1. Burning on the project site.
   2. Burying on the project site.
   3. Dumping or burying on other property, public or private.
   4. Other illegal dumping or burying.
   5. Incineration, either on- or off-site.

G. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 DEFINITIONS

A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.

B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.

C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.

D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.

E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

I. Return: To give back reusable items or unused products to vendors for credit.

J. Reuse: To reuse a construction waste material in some manner on the project site.

K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.

L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

N. Toxic: Poisonous to humans either immediately or after a long period of exposure.

O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
   1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
   2. Submit Report on a form acceptable to Owner.
   3. Landfill Disposal: Include the following information:
      a. Identification of material.
      b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
      c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
      d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
   4. Recycled and Salvaged Materials: Include the following information for each:

a. Identification of material, including those retrieved by installer for use on other projects.
b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.

5. Material Reused on Project: Include the following information for each:
   a. Identification of material and how it was used in the project.
   b. Amount, in tons or cubic yards.
   c. Include weight tickets as evidence of quantity.
6. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 2 PRODUCTS

2.01 PRODUCT SUBSTITUTIONS

A. See Section 01 6000 - Product Requirements for substitution submission procedures.

B. For each proposed product substitution, submit the following information in addition to requirements specified in Section 01 6000:
   1. Relative amount of waste produced, compared to specified product.
   2. Cost savings on waste disposal, compared to specified product, to be deducted from the Contract Sum.
   3. Proposed disposal method for waste product.
   4. Markets for recycled waste product.

PART 3 EXECUTION

3.01 WASTE MANAGEMENT PROCEDURES

A. See Section 01 3000 for additional requirements for project meetings, reports, submittal procedures, and project documentation.

B. See Section 01 5000 for additional requirements related to trash/waste collection and removal facilities and services.

C. See Section 01 6000 for waste prevention requirements related to delivery, storage, and handling.

D. See Section 01 7000 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

3.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.

C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

D. Meetings: Discuss trash/waste management goals and issues at project meetings.
   1. Pre-bid meeting.
   2. Pre-construction meeting.
   3. Regular job-site meetings.

E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
   1. Provide containers as required.
   2. Provide adequate space for pick-up and delivery and convenience to subcontractors.
   3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION

SECTION 01 7800
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project Record Documents.

B. Operation and Maintenance Data.

C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

A. Section 00 7200 - General Conditions: Performance bond and labor and material payment bonds, warranty, and correction of work.

B. Section 01 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

C. Section 01 7000 - Execution and Closeout Requirements: Contract closeout procedures.

D. Individual Product Sections: Specific requirements for operation and maintenance data.

E. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.

B. Operation and Maintenance Data:
   1. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
   2. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
   3. Submit two sets of revised final documents in final form within 10 days after final inspection.

C. Warranties and Bonds:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
   2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Addenda.
   3. Change Orders and other modifications to the Contract.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.

E. Record Drawings: Legibly mark each item to record actual construction including:
   1. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
   2. Field changes of dimension and detail.
   3. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

A. For Each Product or System: List names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
   1. Description of unit or system, and component parts.
   2. Identify function, normal operating characteristics, and limiting conditions.
   3. Include performance curves, with engineering data and tests.
   4. Complete nomenclature and model number of replaceable parts.

B. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

C. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

D. Provide servicing and lubrication schedule, and list of lubricants required.

E. Include manufacturer's printed operation and maintenance instructions.

F. Include sequence of operation by controls manufacturer.

G. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

H. Additional Requirements: As specified in individual product specification sections.

3.05 OPERATION AND MAINTENANCE MANUALS

A. Prepare instructions and data by personnel experienced in maintenance and operation of described products.

B. Prepare data in the form of an instructional manual.

C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

E. Provide tabbed dividers for each separate product and system, with typed description of product and major component parts of equipment.

F. Contents: Prepare a Table of Contents for each volume, with each product or system description identified, in three parts as follows:
   1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect, Contractor, Subcontractors, and major equipment suppliers.
   2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
      a. Significant design criteria.
      b. List of equipment.
      c. Parts list for each component.
      d. Operating instructions.
      e. Maintenance instructions for equipment and systems.
      f. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
   3. Part 3: Project documents and certificates, including the following:
      a. Shop drawings and product data.

3.06 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

E. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.

F. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.

G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.

H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor,

supplier, and manufacturer, with name, address, and telephone number of responsible principal.

END OF SECTION

SECTION 02 4100
DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Selective demolition of built site elements.

B. Selective demolition of building elements for alterations purposes.

C. Abandonment and removal of existing utilities and utility structures.

1.02 REFERENCE STANDARDS

A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.

B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2004.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Site Plan: Showing:
   1. Areas for temporary construction and field offices.

C. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.04 QUALITY ASSURANCE

A. Demolition Firm Qualifications: Company specializing in the type of work required.
   1. Minimum of 5 years of documented experience.

PART 2 PRODUCTS

2.01 MATERIALS

A. Fill Material: As specified in Section 31 2200 - Grading

PART 3 EXECUTION

3.01 SCOPE

A. Remove portions of existing buildings in the following sequence:
   1. As indicated on the drawings.

B. Remove paving and curbs as required to accomplish new work.

C. Remove all other paving and curbs as indicated on drawings.

D. Remove concrete slabs on grade within construction limits indicated on drawings.

E. Remove other items indicated, for salvage, relocation, and recycling.

F. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as required so that required rough grade elevations do not subside within one year after completion.

3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.

3. Provide, erect, and maintain temporary barriers and security devices.
4. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
5. Do not close or obstruct roadways or sidewalks without permit.
6. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
7. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.

B. Do not begin removal until receipt of notification to proceed from Owner.

C. Protect existing structures and other elements that are not to be removed.
1. Provide bracing and shoring.
2. Prevent movement or settlement of adjacent structures.
3. Stop work immediately if adjacent structures appear to be in danger.

D. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

E. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.

F. Hazardous Materials: Comply with 29 CFR 1926 and state and local regulations.

G. Perform demolition in a manner that maximizes salvage and recycling of materials.
1. Comply with requirements of Section 01 7419 - Waste Management.
2. Dismantle existing construction and separate materials.
3. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

H. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

3.03 EXISTING UTILITIES

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

3.04 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
1. Verify that construction and utility arrangements are as shown.

2. Report discrepancies to Architect before disturbing existing installation.
3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.

B. Separate areas in which demolition is being conducted from other areas that are still occupied.
1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 5000 in locations indicated on drawings.

C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.

D. Remove existing work as indicated and as required to accomplish new work.
1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
2. Remove items indicated on drawings.

E. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.
1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
3. Verify that abandoned services serve only abandoned facilities before removal.
4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.

F. Protect existing work to remain.
1. Prevent movement of structure; provide shoring and bracing if necessary.
2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
3. Repair adjacent construction and finishes damaged during removal work.
4. Patch as specified for patching new work.

3.05 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Remove from site all materials not to be reused on site; comply with requirements of Section 01 7419 - Waste Management.

C. Leave site in clean condition, ready for subsequent work.

D. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 02 4116

SITE DEMOLITION

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Provide labor, material and equipment necessary to remove existing building, equipment pads, foundations, paving, curb and gutter, underground tanks, pipes and utilities and site items as required.

1.02 SUBMITTALS

A. Schedule: Submit proposed methods and operations of demolition to the Owner for review prior to the start of work. Include in the schedule the coordination for shut-off, capping and continuation of utility services as required. Obtain necessary permits required for demolition and submit copies to the Owner before beginning demolition work.

1.03 PROTECTION

A. Protection of Existing Work: Before beginning cutting or demolition work, carefully survey the existing work and examine the drawings and specifications to determine the extent of the work. Take necessary precautions to insure against damage to existing work to remain in place, to be reused, or to remain the property of the Owner. Repair or replace damage to work at no additional cost to the Owner. Carefully coordinate the work of this section with other work and construct and maintain shoring, bracing and supports, as required. Ensure that structural elements are not overloaded. Increase structural supports or add new supports as required as a result of cutting, removal, or demolition work performed.

PART 2 PRODUCTS

2.01 MATERIALS

A. Use the proper tools and equipment to complete the work in a safe, non-hazardous manner.

PART 3 EXECUTION

3.01 DEMOLITION

A. Structures: Demolish existing structures by breaking these materials into smaller pieces for transport. The use of explosives is not permitted.

B. Utilities: Remove or abandon in place existing utilities as indicated on the drawings. Disconnect utility services, with related meters and equipment, employing appropriate utility company. When utility lines are encountered that are not indicated on the drawings, notify the Owner.

3.02 DISPOSITION OF MATERIALS

A. Dispose of demolished materials off of the project site unless otherwise notified by the Owner. Transport materials in a manner that will prevent spillage on streets and adjacent areas. Dispose of materials in a manner acceptable to the regulatory agency having jurisdiction.

3.03 PROTECTION OF TREES

A. Protect trees to remain in the manner described in the Section CLEARING AND GRUBBING.

B. Provide tree protection measures prior to beginning of demolition and maintain throughout the work period.

3.04 BACKFILLING AND COMPACTION

A. Backfill holes and depressions resulting from demolition as specified in the Section EARTHWORK.

B. Meet backfill requirements for the final intended use of the area. Where the final use is undefined, meet as a minimum the backfill requirements for General Area Fill.

END OF SECTION

SECTION 03 0100
CONCRETE TESTING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Concrete testing includes verifying Contractor's proposed mix designs; inspecting of concrete mixing, sampling and testing concrete at frequencies specified and conducting core tests and other additional testing, when required.

1.2 TESTING AGENCY

A. Concrete testing shall be performed by an independent Testing Agency selected by Architect and paid by the Owner.

B. Duties: Testing Agency will perform the following functions:

1. Verify mix designs for concrete classes specified.
2. Review concrete materials for compliance with specifications.
3. Sample concrete at project site and prepare compressive strength test specimens, tests for slump, air content and unit weight.
4. Maintain test data sheet for each set of concrete specimens.
5. Perform specified laboratory tests.
6. Notify Architect immediately of any test specimens that do not meet design compressive strength at 28 days or 2/3 of design strength at seven days.
7. Distribute copies of test data sheets to Architect and Contractor.

C. Contractor's duties relative to testing:

1. Deliver materials to Testing Agency's laboratory for use in verifying design mixes.
2. Advise Testing Agency sufficiently in advance of operations to allow for completion of quality tests and for assignment of personnel.
3. Store cylinders at project site in storage box for 24 hours after molding. Provide labor to assist in obtaining and handling samples.
4. Deliver cylinders to Testing Agency's laboratory.

D. Contractor shall designate one individual in his organization to be responsible for conducting Contractor's duties relative to testing. Testing Agency will instruct individual in his duties. Individual shall not be changed without notice to Architect.

1.3 ACCEPTANCE OF CONCRETE

A. Compressive strength of concrete will be considered satisfactory if averages of all sets of three compressive strength test results equal or exceed the required design compressive strength and no individual strength test result falls below design compressive strength by more than 500 psi.

1.4 REFERENCES

A. American Concrete Institute (ACI):

1. ACI 301-05 Specification for Structural Concrete for Buildings.

2. ACI 304R-00 Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.

B. American Society for Testing and Materials (ASTM):

1. ASTM C31-03a Making and Curing Concrete Test Specimens in the Field.

2. ASTM C39-96 Test Method for Compressive Strength of Cylindrical Concrete Specimens.

3. ASTM C94-04 Ready-Mixed Concrete.

4. ASTM C143-05 Test Method for Slump of Hydraulic Cement Concrete.

5. ASTM C172-04 Sampling Freshly Mixed Concrete

6. ASTM C173-01e1 Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.

7. ASTM C231-04 Air Content of Freshly Mixed Concrete by the Pressure Method.

PART 2 – PRODUCTS

2.1 EQUIPMENT

A. Testing Agency will maintain supplies, apparatus, tools and devices at project site to obtain specimens and perform on-site test as indicated, including:

1. Molds for compressive strength test specimens.

2. Slump comes with rod for slump test.

3. Scale and unit weight measure.

4. Thermometers.

5. Concrete thermometer.

6. Air meters.

B. Contractor shall provide stable, lockable, insulated store box, thermostatically controlled to maintain temperature between 60 and 80 degrees F. for storage of cylinders for first 24 hours after molding. Box shall have minimum capacity of 40 cu. ft. Locate box in a permanent lockable are of approximately 100 sq. ft. Limit access to Testing Agency personnel and Contractor's designated agent.

PART 3 – EXECUTION

3.1 FREQUENCY AND QUALITY OF SAMPLES

A. Specimens will be taken for acceptance testing for each concrete mix design not less than once a day nor less than once for each 100 cubic yards of concrete or for each 5000 sq. ft. of surface area. Each specimen will consist of four molded cylinders.

B. Specimens will be taken for each concrete mix design on each day in which concrete of the mix design is placed.

C. When the frequency of testing will provide less than five acceptance tests for a given mix design, tests will be made from at least five batches selected at random or from each batch.

D. Field specimens for acceptance testing and initial 24-hour period curing will be performed in accordance with ASTM C172.

E. Slump tests will be conducted each time a set of specimens is prepared for compressive strength testing. Testing will be in accordance with ASTM C231 for normal weight concrete.

F. Test for air content will be conducted each time a set of specimens if prepared for compressive strength testing. Testing will be in accordance with ASTM C173.

G. Specimens will be laboratory cured in accordance with ASTM C31.

3.2 LABORATORY TESTING

A. Laboratory compressive strength tests will be performed on cured specimens in accordance with ASTM C39.

B. Testing of one cylinder per specimen will be performed at three days for post-tensioned concrete.

C. Acceptance testing will be performed using two cylinders per specimen at 28 days. Each acceptance test result will be the average of the two cylinders.

D. If one test cylinder for a specimen indicates improper sampling, molding, curing or testing, the questionable cylinder will be discarded and remaining cylinders tested to obtain acceptance test results.

E. Extra test cylinders not used in acceptance testing will be discarded.

3.3 ADDITIONAL TESTING

A. Additional testing, including core tests, load tests, non-destructive or other tests, testing as designated by Architect will be required whenever concrete fails to meet acceptance criteria. Testing will be conducted in accordance with ACI 301. Cost of additional testing for non-conforming work shall be borne by Contractor.

END OF SECTION

SECTION 03 2000
CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Reinforcing steel bars, wire fabric and accessories for cast-in-place concrete.

1.2 RELATED SECTIONS

A. Section 03 0100 - Concrete Testing.

B. Section 03 3000 - Cast-in-Place Concrete.

1.3 REFERENCES

A. American Concrete Institute (ACI):
1. ACI 301-05 Specification for Structural Concrete for Buildings.
2. ACI 315-99 Detailing Manual

B. American Society for Testing and Materials (ASTM):
1. ASTM A108-99 Steel Bars, Carbon, Cold Finished, Structural Quality.
2. ANSI/ASTM A185-02 Steel Welded Wire Reinforcement, Plain for Concrete.
3. ASTM A496-02 Steel Wire, Deformed, for Concrete Reinforcement.
4. ASTM A615-04a Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
5. ASTM A706-04a Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
6. ASTM D1751-(83)1991 Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).

C. American Welding Society (AWS):
1. ANSI/AWS D1.1-04 - Structural Welding Code-Steel.
2. ANSI/AWS D1.4-98 - Structural Welding Code-Reinforcing Steel.

D. Concrete Reinforcing Steel Institute (CRSI):
1. CRSI MSP - Manual of Standard Practice, 27th Edition, 2001.
2. CRSI Recommended Practice For Placing Reinforcing Bars, 7th Edition, 1997.
3. CRSI Reinforcement Anchorage and Splices, 4th Edition, 1997.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings:
1. Indicate bar size, spacing, location, placement and quantity of reinforcing steel and wire fabric.
2. Bending and cutting schedules.
3. Supporting and spacing devices.

4. Use the same designation numbers for slabs and footings as used on the Drawings.
5. Detail walls in elevation.

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

D. Submit manufacturer's data and installation instructions for:
1. Mechanical splice device.
2. Headed concrete anchor.
3. Deformed bar anchor.

E. Welder's qualification certificates.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with CRSI Manual of Practice ACI 301 and ACI 315.

B. Submit certified copies of mill test report of reinforcement materials analysis.

C. Employ welders on the Work that have successfully qualified for the welding positions required in accordance with Chapter 6, Qualification, AWS D1.4 within the last 12 months. Welders are required to carry proof of their qualification on their person.

1.6 COORDINATION

A. Coordinate with placement of formwork, formed openings and other Work.

PART 2 - PRODUCTS

2.1 REINFORCEMENT

A. Reinforcing Steel: ASTM A615, 60 ksi yield grade; deformed billet steel bars.

B. Reinforcing Steel: ASTM A706, 60 ksi yield grade; deformed low-alloy steel bars.

C. Welded Steel Wire Fabric: ASTM A185 Plain Type; flat sheets.

D. Deformed Bar Anchors:
1. Flux filled.
2. Made from cold drawn steel in accordance with ASTM A-108, yield strength, 70 ksi.
3. Deformed in accordance with ASTM A-496.

2.2 ACCESSORY MATERIALS

A. Tie Wire: Minimum 16 gage annealed type.

B. Bar Support: Includes spacers, chairs, bolsters, ties and other devices for spacing, supporting and fastening reinforcement in place.
1. General: In accordance with CRSI Manual of Standard Practice.
2. Factory made.

3. Use bar support heights that produce the concrete cover called for on the Drawings.
4. Use bar supports capable of supporting construction loads without permanent deflection.
5. Spacing: At 4 feet maximum with first support 2 feet from end of bar supported.
6. Exposed Concrete: Provide supports in contact with formwork that are:
    a. High density all plastic (CRSI Class 1).
7. Typical support types and minimum configurations.
    a. Slab Bolsters: continuous, type 7 ga. wire or cementitious fiber reinforced.
    b. Individual high chairs:
        1) Legs 5 inch and under: 2 ga. wire, or high density all plastic.
        2) Legs 5 to 12 inches: 0 ga. wire.
        3) Do not use individual high chairs with legs over 12 inches.
    c. Vertical reinforcement: wheel type, high density all plastic.
    d. Supports bearing on earth.
        1) Precast concrete blocks.
        2) Support specifically designed for this purpose, e.g. with sand plates.

C. Slab-On-Grade Expansion Joint Filler: Non-extruded bituminous type conforming to ASTM D1751.

D. Slab-On-Grade Construction Joint: Minimum 24 ga. galvanized steel with formed tongue and groove keyed joint, full depth of slab. Furnish complete with stake pins.

E. Expansion Bolts:
1. Install in strict accordance with manufacturer's recommendations.
2. Acceptable manufacturer's:
    a. Hilti Fastening Systems Inc., Hilti Kwik Bolt TZ, Carbon Steel.
    b. Simpson Strong-tie, Strong-Bolt

F. Adhesive Anchor:
1. Install in strict accordance with manufacturer's recommendations.
2. Acceptable manufacturers:
    a. Hilti Fastening Systems Inc., Hilti HIT-RE 500 Adhesive System with HAS-Super anchor rod.
    b. Simpson Strong-tie, SET-XP with IXP Anchor rods

G. Screw Anchor:
1. Install in strict accordance with manufacturer's recommendations.
2. Acceptable manufacturer's:
    a. Simpson Strong-tie, Titen HD

2.3 FABRICATION

A. Fabricate concrete reinforcing in accordance with CRSI Manual of Standard Practice.

B. Locate reinforcing splices where indicated on Drawings.

PART 3 - EXECUTION

3.1 PLACEMENT

A. Place, support and secure reinforcement against displacement. Do not deviate from required position.

B. Do not displace or damage vapor barrier.

C. Accommodate placement of formed openings.

D. Conform to ACI 318 for concrete cover over reinforcement.

3.2 WELDING

A. Reinforcing Bars:
1. General: Welding of reinforcing bars is only permitted at locations expressly detailed or permitted in writing by the Structural Engineer.
2. Execute all welding in accordance with AWS D1.4.
3. Provide reinforcing bars conforming to ASTM A 706 for welding unless permitted in writing by the Structural Engineer.
4. Welding of crossing bars (tack welding) is prohibited.

B. Headed concrete anchors and deformed bar anchors:
1. Install in strict accordance to manufacturer's recommendations, and in accordance with Chapter 7, Stud Welding, AWS D1.1.

3.3 FIELD QUALITY CONTROL

A. Notify the Architect 24 hours, minimum, prior to concrete placement to allow time for review of installation of all concrete reinforcement.

B. Correction of reinforcement not installed in accordance with the Contract Documents is the Contractor's responsibility.

C. Inspect installation of headed concrete anchors and deformed bar anchors in accordance with Chapter 7, Stud Welding, AWS D1.1.

END OF SECTION

SECTION 03 3000
CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Cast-in-place Concrete
   1. Floors.
   2. Foundation walls.
   3. Supported slabs.

B. Slabs on grade.

C. Control and expansion joint devices associated with concrete work.

D. Equipment pads.

1.2 RELATED SECTIONS

A. Section 03 0100 - Concrete Testing.

B. Section 03 2000 - Concrete Reinforcement.

1.3 REFERENCES

A. American Concrete Institute (ACI):
   1. ACI 301-05 Specification for Structural Concrete for Buildings.
   2. ACI 302.1R-04 Guide for Concrete Floor and Slab Construction.
   3. ACI 304R-00 Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.
   4. ACI 304.2 R-96 Placing Concrete by Pumping Methods.
   5. ACI 305R-99 Hot Weather Placing concrete.
   6. ACI 306R-88 Cold Weather Placing concrete.
   7. ACI 308-92 Standard Practice for Curing Concrete.
   8. ACI 318-05 Building Code Requirements for Structural Concrete.
   9. SP-15 (95), field reference manual, specifications for structural concrete buildings, ACI 301-96 with selected ACI and ASTM references.

B. American Society for Testing and Materials (ASTM):
   1. ASTM C31-03a Making and Curing Concrete Test Specimens in the Field.
   2. ASTM C33-03 Concrete Aggregates.
   3. ASTM C94-04 Ready-Mixed Concrete.
   4. ASTM C143-05 Test Method for Slump of Hydraulic Cement Concrete.
   5. ASTM C150-04 Specification for Portland Cement.
   6 ASTM C171-97 Sheet Materials for Curing Concrete.

7. ASTM C173-94ael Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
8. ASTM C230-97 Flow Table for Use in Tests of Hydraulic Cement.
9. ASTM C231-04 Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
10. ASTM C260-00 Air-Entraining Admixtures for Concrete.
11. ASTM C330-04 Lightweight Aggregates for Structural Concrete.
12. ASTM C494-98 Chemical Admixtures for Concrete.
13. ASTM C618-99 Coal Fly Ash and Raw or Calcinated Natural Pozzolan for Use as a Mineral Admixture in Concrete.
14. ASTM D1751-83 (1991) Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
15. ASTM E1155-96 Determining Floor Flatness.

C. Department of the Army, U.S. Army Corps of Engineers (USACE)
1. CRD - C621-88 Specification for Non-Shrink Grout.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300 - Submittals.

B. Product Data
1. Mix design for each class of concrete.
    a. Fully document proposed materials and mix designs.
    b. Submit mix design for review by testing laboratory.
    c. Submit mix design and documentation 28 days, minimum, prior to use in field.
2. Manufacturer’s recommendations for use of admixtures and curing compound.

C. Quality Control Submittals: Submit two copies plus the number the contractor wants returned.
1. Mill test of Portland cement.
2. Aggregate tests.
3. Field cast cylinders. See 3.8 Field Quality Control.
4. Floor finish tolerance:
    a. Report of flatness and levelness test results for each test area.
    b. Layout of test sections and sample measurement lines with each test area. Provide layout before start of testing operations.

1.5 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 01720 - Preparation.

B. Accurately record actual locations of embedded utilities and components which are concealed from view.

1.6 QUALITY ASSURANCE

A. Field References: Maintain one copy of each reference listed below in Contractor's field office at all times.
   1. ACI SP-15-99, Field Reference Manual.

B. Perform Work in accordance with ACI 301.

C. Acquire cement and aggregate from same source for all work.

D. Conform to ACI 305R when placing concrete during hot weather.

E. Conform to ACI 306R when placing concrete during cold weather.

1.7 COORDINATION

A. Coordinate the placement of joint devices with erection of concrete formwork and placement of form accessories.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

A. Cement: ASTM C150, Type I or III, natural color, domestic manufacture. One brand should be used throughout the project.

B. Aggregate:
   1. Normal Weight
      a. Fine Aggregate: Quartz sand free of sulfates ASTM C33.
      b. Coarse Aggregate: ASTM C33.
   2. Lightweight
      a. Coarse Aggregate: ASTM C330, aggregate shall be composed entirely of lightweight cellular inorganic material.

C. Water: clean, potable, and free from deleterious amounts of acids, alkalis, or organic materials.

2.2 ADMIXTURES

A. General: Do not use calcium chloride or admixtures containing more than 0.1% chloride ions.

B. Air Entraining: ASTM C260.

C. Water-Reducing: ASTM C494, Type A.

D. Water-Reducing and Retarding: ASTM C494, Type D.

E. High Range Water-Reducing (Superplasticizer): ASTM C494, Type F or G.
   1. The Euclid Chemical Company:
      a. Type F: Eucon-37.
      b. Type G: Eucon-537.
   2. Grace Construction Products:
      a. Type F: Daracem-100.
      b. Type G: Daracem-100.
   3. Master Builders Technologies:
      a. Type F: Rheobuild 1000.
      b. Type G: Rheobuild 716.
   4. Substitutions: Under provisions of Section 01630 – Product Substitution Procedures.

F. Fly Ash: ASTM C618, Type C or F.
   1. Use when permitted by Architect.
   2. Limit use to not exceed 25% of cement content by weight.

G. Silica Fume: Provide one of the following:
   1. W.R. Grace & Co., Force 10,000.
   2. Sika Corporation, Sikacrete 950.
   3. Master Builders Inc., MB-SF.
   4. Substitutions: Under provisions of Section 01630 – Product Substitution Procedures.

2.3 ACCESSORIES

A. Bonding Agent: Polymer resin emulsion, polyvinyl acetate, latex emulsion.

B. Non-Shrink Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 7,000 psi in 28 days; and conforming to CRD-C-621.

C. Curing Materials:
   1. Moisture retaining sheet: One of the following, complying with ASTM C 171.
      a. Waterproof paper
      b. Polyethylene film
      c. Polyethylene-coated burlap

   2. Liquid membrane forming curing compound:
      a. Use on a surface to be cured where:
         1) A topping material will not be required to bond.
         2) A penetrating sealer will not be applied.
      b. Use one of the following:
         1) L & M Chemicals, Inc. Dress & Seal 30.
         2) Master Builders, Master Kure
         3) Euclid Chemical Co., Super Rez-Seal.
         4) Sonneborn Building Products, Kure-n-Seal 30.
         5) Substitutions: Under provisions of Section 01630.
      c. To be used where a topping material or penetrating sealer will be required to bond to the surface to which this material is applied. Use the following:

1) Euclid Chemical Company, Kurez DR.
2) Substitutions: Under provisions of Section 01630 – Product Substitution Procedures.

D. Penetrating Sealer: One component silane penetrant for preventing the intrusion of water and water-borne salts. Provide a sealer that exceeds the performance criteria of the National Cooperative Highway Research Program (NCHRP) Report #224. Install in strict accordance with manufacture's recommendations. Use one of the following:
1. Master Builders, Masterseal SL
2. L & M Chemicals, Inc. Pentane
3. Harry S. Peterson Co., Inc., ISO Flex 618.
4. Substitutions: Under provisions of Section 01630 – Product Substitution Procedures.

E. Self Leveling Concrete Topping: Portland cement-base self-drying, self-leveling cementitious topping. Applied by a factory trained applicator having specific experience with the installation of the product. All concrete subfloors shall be solid, thoroughly cleaned, free of oil, wax, grease, asphalt, paint, latex compounds, curing and sealing compounds, adhesive residues, and any contaminant which could act as a bond breaker. Subsurface shall be clean, dry, and properly primed. Install per Manufacturer's recommendations. Use one of the following:

1. Ardex Incorporated, Ardex SD-T.
2. Dayton Superior Corporation, LeveLayer III.
3. Maxxon Corporation, Level-Right Plus.

2.4 NON-SHRINK GROUT

A. Install in strict accordance to manufacturer's recommendations found in each manufacturer's data publication.

B. Acceptable Manufacturers:
1. Master Builders, Masterflow 928 Grout
   a. Application: Fluid installation consistency.
2. Master Builders, Set Grout
   a. Application: Stiff or plastic installation consistency.
3. The Euclid Chemical Company, Hi-Flow Grout
   a. Application: Fluid installation.
4. The Euclid Chemical Company, EUCO N-S Grout
   a. Application: Stiff or plastic installation consistency.
5. Burke, Non-ferrous, Non-shrink Grout
   a. Application: Fluid installation consistency.
6. Burke, Damp Pack Grout
   a. Application: Stiff of plastic installation consistency.
7. Substitutions: Under provisions of Section 01630 – Product Substitution Procedures.

C. Installation Consistency Criteria:
1. Fluid:
   a. Requires forming for installation.
   b. 25 to 30 seconds flow by CRD-C611. Flow Cone Method.
2. Plastic or Stiff:

a. Does not require forming.
b. Plastic: 100% flow by ASTM C 230.
c. Stiff: 40% flow by ASTM C 230.

2.5 JOINT DEVICES AND FILLER MATERIALS

A. Joint Filler ASTM D1751; Asphalt impregnated fiberboard or felt, ½ inch thick; tongue and groove profile.
B. Construction Joint Devices for Slabs-On-Grade: Integral galvanized steel 24 gauge formed to tongue and groove profile, ribbed steel spikes with tongue to fit top screed edge.
C. Sealant and Primer: As specified in Section 07920 – Joint Sealants.

2.6 CONCRETE MIX

A. Mix concrete in accordance with ACI 304. Deliver concrete in accordance with ASTM C94.

B. Concrete Mix Designs:
1. Established concrete mix proportions on the basis of field experience or laboratory trial batches as specified in ACI 301 in Section 3.9, "Proportioning on the basis of previous field experience or trial mixtures," with the following exceptions:
   a. The standard deviation is determined from tests of mixes that:
      1) Contain the same materials as mix designs for the proposed work.
      2) Represent concrete produced to meet the same design strength as that specified for the proposed work.
   b. When acceptable field test records or trial mixture data is not available, and, if approved by the Architect, the concrete mix proportions may be established as specified in ACI 301, Section 3.10, "Proportioning based on empirical data."
   c. Retain an independent testing laboratory to conduct tests made on trial mixes used in proportioning concrete mixes for the proposed work.
      1) Produce trial mixes within 12 months of submission of mix design for approval.

C. The following classes of concrete are required:

Minimum Acceptance

Class	Compressive Strength, f'c (PSI)	Criteria Interval (DAYS)	Slump Range[1] (INCHES)
A	3000	28	4 + 1
B	4000	28	4 + 1
C	5000	28	5 + 1
D	6000	28	5 + 1

D. Air Content:
1. Provide concrete containing entrained air as noted and conforming to ACI 301 when concrete will be subject to potentially destructive exposure (other than wear of loading)

such as freezing and thawing and severe weathering.

2. Provide concrete containing a maximum air content of 3% when used in interior slabs subject to abrasion.

E. Use accelerating admixtures in cold weather only when approved by Architect/Engineer. Use of admixtures will not relax cold weather placement requirements.

F. Use set retarding admixtures during hot weather only when approved by Architect/Engineer.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrate and conditions under which concrete work is to be performed.
   1. Have installer notify the Contractor in writing, with a copy to the Architect, if substrate is unsatisfactory.
   2. Do not begin work until unsatisfactory conditions have been corrected in a manner acceptable to the installer.
   3. Beginning of work indicates the substrate is acceptable and satisfactory to the installer.

B. Verify that reinforcement is in place, fastened, supported, protected against displacement, and that no reinforcement is touching formwork.

C. Verify that conduits, pipes, sleeves, inserts, hangers, steel equipment, grounds, anchors and work that is to be built into the concrete are accurately placed, positioned securely, and will not cause hardship in placing the concrete.

3.2 PREPARATION

A. General: In accordance with ACI 301.

B. Surface Preparation:
   1. Remove debris and foreign matter from forms. Drain water from footing trenches and remove mud film and loose dirt.
   2. Soak wood forms with water and coat metal and fiberglass forms with oil.
   3. Notify Architect at least 24 hrs. before placing is begun.
   4. Do not place concrete on earth until bearing values have been verified by the testing laboratory.

C. Install vapor barrier under interior slabs on grade. Lap joints minimum 6 inches and seal watertight by taping edges and ends.

D. Install joint fillers, primer, and sealant in accordance with manufacturer’s instructions.

E. Separate slabs on grade from vertical surfaces with 1/2 inch thick joint filler.

F. Extend joint filler from bottom of slab to within 1/2 inch of finished slab surface.

G. Install joint devices in accordance with manufacturer's instructions.

H. Install joint device anchors. Maintain correct position to allow joint cover flush with floor and wall finish.

3.3 PLACING CONCRETE

A. General:
   1. Place concrete in accordance with ACI 301 and as specified in this section.
   2. Mix and discharge concrete in such quantities as required for immediate use and place fresh before loss of slump occurs.
   3. Completely discharge concrete within 1-1/2 hours or before drum has revolved 300 revolutions, whichever comes first, after introduction of the mixing water to the cement and aggregates or introduction of cement to the aggregates.

B. Transportation:
   1. Transport concrete to point of final deposit by cart, buggy, conveyor, or pump. If concrete is to be transported more than 50 ft. in carts or buggies, equip them with pneumatic tires.
   2. Move carts and buggies only on temporary runways built over the floor system. Do not allow runway supports to bear on reinforcement or fresh concrete.

C. Repair vapor barrier damaged during placement of concrete reinforcing. Repair with vapor barrier material; lap over damaged areas minimum 6 inches and seal watertight.

D. Install construction joint device in coordination with floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

E. Install joint covers in longest practical length, when adjacent construction activity is complete.

F. Place concrete continuously between predetermined expansion, control, and construction joints.

G. Do not interrupt successive placement; do not permit cold joints to occur.

H. Saw cut joints in slab-on-grade within 24 hours after placing. Using 3/16 inch thick blade, cut into ¼ depth of slab thickness.

3.4 SEPARATE FLOOR TOPPINGS

A. Prior to placing floor topping, remove deleterious material. Broom and vacuum clean.

B. Place required dividers, edge strips, reinforcing, and other items to be cast in.

C. Apply bonding agent to substrate in accordance with manufacturer's instructions.

D. Place concrete floor toppings to required lines and levels.

3.5 FLOOR FINISH TOLERANCE

A. Interior Slabs
   1. General:
      a. In accordance with ACI 302 and ASTM E 1155.
      b. Testing laboratory to perform all tests and prepare reports for floor finish tolerance.
      c. When ambient or slab temperatures are less than 40^{o} (F.) or more than 100^{o} (F.) obtain individual slab elevations manually. Electronic recording of readings outside of this temperature range is not acceptable unless a submittal from the manufacturer of the recording device stating a different accurate operating range is submitted to the engineer for review before using the equipment.
   2. Test layout: In accordance with ASTM E 1155.
      a. Test area: Area of concrete placed in a continuous pour.
      b. Test sections: Area bounded by grid lines, slab edges, or construction joints.
      c. Sample measurement lines: As defined in ASTM E 1155.
   3. Flatness and levelness tolerance:
      a. Specified overall value (SOV):
         1) Floor flatness $= F_F$ (SOV) = 20.
         2) Floor levelness $= F_L$ (SOV) = 15.
      b. Minimum local value (MLV):
         1) Floor flatness $= F_F$ (MLV)= 15.
         2) Floor levelness $= F_L$ (MLV)= 10.
   4. Timeliness of tests:
      a. Obtain floor tolerance measurements within 24 hours after slab installation.
      b. Obtain measurements prior to removal of shores and forms supporting floor being measured.
   5. Test reports for floor finish tolerance:
      a. Provide report of test results to contractor and architect within 72 hours after slab installation.
      b. Include in the report a running tabulation of all overall F_F and overall F_L values of slabs installed to date.
   6. Acceptance criteria: Remedial work may be required if either of the following is not met.
      a. The composite value of the entire test area must be equal or greater than either the entire specified overall F-numbers.
      b. The values for any test section must be equal or greater than either of the minimum local F-numbers.
   7. Remedial work:
      a. Remedial work may include grinding, planning, skimming, re-topping, or removal and replacement.
      b. Contractor shall submit method and materials proposed for remedial work at each location to the architect for review.
      c. Retest is required for all repaired work within two weeks to confirm conformance with floor finish criteria.
      d. The contractor is responsible for correction of floors finished out of tolerance.

B. Exterior slabs
   1. Finish exterior slabs to drain freely.

2. Cut out and replace depressions that hold water.

3.6 CONCRETE FINISHING

A. Formed Surfaces
   1. Formed concrete interior vertical surfaces to be left exposed to view or to receive an applied finish, provide smooth form finish.
   2. Formed concrete interior horizontal surfaces to be left exposed to view or to receive an applied finish, provide smooth rubbed finish.
   3. Formed surfaces not exposed to view or to receive an applied finish, provide rough form finish.

B. Finish concrete floor surfaces in accordance with ACI 301.
   1. Wood Float Finish: Surfaces to receive modified asphalt roof membrane system and surfaces to receive finishes applied with thickset tile or thickset stone.
   2. Smooth Troweled Finish: Surfaces to receive membrane waterproofing, EPDM fully adhered roof membrane, and all other surfaces whether scheduled to receive additional finish materials or not.
   3. Broom Finish: Exit stairs and locations noted on finish schedule of the Drawings.

3.7 CURING AND PROTECTION

A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

C. Cure floor surfaces in accordance with ACI 308.

D. Surfaces to receive roof membranes and membrane waterproofing: Moisture cure only; do not use curing compounds or penetrating sealer.

E. Ponding: Maintain 100 percent coverage of water over floor slab areas continuously for 4 days.

F. Spraying: Spray water over floor slab areas and maintain wet for 7 days.

G. Membrane forming curing compound:
   1. Flatwork: Coat with curing compound immediately after final troweling when surface water sheen has disappeared.
   2. Formed vertical surfaces: Apply immediately after form removal.

H. Apply sealing and curing compound to the following areas at substantial completion.
   1. Mechanical rooms.
   2. Electrical rooms.
   3. Storerooms.
   4. Janitor closets.
   5. Stairs.

6. Service corridors.
7. Any other concrete slab that will not to receive a finish material or surface treatment and will remain exposed.

I. Duration of curing procedures: Conform to paragraph 12.2.3 ACI 301.

3.8 FIELD QUALITY CONTROL

A. Field testing will be performed in accordance with ACI 301 and under provisions of Section 03010 – Concrete Testing.

B. Provide free access to Work and cooperate with appointed firm.

C. Sampling of Concrete
1. General: In accordance with ASTM C31.
2. Frequency: Obtain one set of test specimens for each 100 cu. yds., or fraction thereof, of each mix design placed in one day.
3. Number of specimens in a set.
    a. Twenty-eight day acceptance criteria (for concrete class B, C, D and E.) four 6x12 cylinders.

D. Site testing performed when each set of test specimens is made.
1. Slump: In accordance with ASTM C143.
2. Air Content: In accordance with ASTM C231, pressure method for normal weight concrete or ASTM C173, volumetric method for lightweight and normal weight concrete.
3. Temperature: Determine the ambient temperature and the temperature of the sample.

E. Laboratory Testing
1. Unit weight.
2. Compressive strength verification: In accordance with ASTM C31.
3. Frequency of testing for compressive strength verification:
    a. Twenty-eight day acceptance criteria:
        1) One cylinder tested at seven days for information.
        2) Two cylinders tested at twenty-eight days for acceptance.
        3) One cylinder held in reserve.

3.9 REPAIR OF SURFACE DEFECTS

A. General: Surface defects occur between the surface of the concrete and the first layer of reinforcement below.
B. Inspect concrete surfaces immediately upon removal of forms.

C. Excessive honeycombing or embedded debris in concrete is not acceptable. Notify Architect/Engineer upon discovery.

D. After specific instructions by Architect/Engineer, patch imperfections in accordance with Chapter 9, Repair of Surface Defects, ACI 301.

3.10 DEFECTIVE CONCRETE

A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances, specified requirements, or cold joints.

B. Repair or replacement of defective concrete will be determined by the Architect/Engineer.

C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect/Engineer for each individual area.

END OF SECTION

SECTION 03 3500

CONCRETE FINISHES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Related work:

1. Cast-In-Place Concrete
2. Concrete Reinforcement
3. Concrete Testing

1.2 SUBMITTALS

A. Product data: Submit manufacturer's product data and installation specifications for all manufactured products.

1.3 JOB CONDITIONS

A. Maintain temperature of concrete above 50 degrees F. for seven days after placing. Protect work against frost, rapid drying and heavy rain.

1.4 REFERENCES

A. American Concrete Institute (ACI):

1. ACI 302.1R-04, "Guide for Concrete Floor and Slab Construction."
2. ACI 304R-00, "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete."

B. American Society for Testing and Materials (ASTM):

1. ASTM C156-98, "Test for Water Retention by Concrete Curing Materials."
2. ASTM C171-97a, "Standard Specification for Sheet Materials for Curing Concrete."
3. ASTM C309-97, "Liquid Membrane-Forming Compounds for Curing Concrete."

PART 2 – PRODUCTS

2.1 CURING COMPOUND

A. Acceptable products:

1. Euclid Chemical Co. – Rez-Seal.
2. Guardian Chemical Co. – Clear Bond.
3. Burke Company – Spartan-Cote Cure-Seal-Hardener.

2.2 MEMBRANE CURING COMPOUND AND BOND BREAKER

A. Acceptable products:

1. Burke Company – Super Bond Breaker.
2. Conspec – Tilt-Eez.

3. Substitutions – As provided in Substitution Section.

2.3 EVAPORATION RETARDANT

A. Acceptable products:

1. Euclid Chemical Company – Eucobar.
2. Master Builders – Confilm.
3. Substitutions – As provided in Section 01630 – Product Substitution Procedures.

2.4 WET CURING MATERIALS

A. Sand: Clean, natural sand meeting ASTM C144.

B. Moisture-Retaining Cover: Waterproof paper, polyethylene film or burlap-polyethylene sheet meeting ASTM C171.

C. Water: Clean, potable free of alkali, acid, oil or organic matter.

2.5 ABRASIVE AGGREGATE

A. Aluminum oxide or emery graded from particles retained on a #50 mesh screen to particles passed by a 1/8" screen.

2.6 CONCRETE BONDING AGENT

A. Acceptable products:

1. Burke Concrete Accessories, Inc. – Bondcrete-S.
2. Euclid Chemical Co. – Flexcon.
3. Sika Chemical Corp. – Sika Latex.
4. Sonneborn Div. Of Contech, Inc. – Sonocrete.

B. Characteristics: Acrylic latex emulsion, non-reversible.

PART 3 – EXECUTION

3.1 SLAB FINISHES

A. Screed floor slabs to even surface by use of straightedge and screeding strips, within tolerances prescribed by ACI-301 and ACI-117 for specified slab finish.

B. Float surfaces on concrete with wood float in manner, which will compact concrete and produce surface free of depressions or ridges. Test for grade or level and correct as necessary by removing excess or adding and compacting additional concrete. Surfaces to receive float finish include slabs to receive setting beds.

C. Trowel Finish: Apply trowel finish to designated monolithic slab surfaces. After floating, begin first trowel finish operation using power-driven trowel. Begin final troweling when surface produces ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand troweling operation, free of trowel marks, uniform in texture and appearance, and with surface plane tolerances not exceeding 1/4" in 10'-0" when tested with a 10'-0" straightedge. The following surfaces shall receive a trowel finish:

1. Slabs to be exposed in the finished work, except where designated to receive a non-slip broom finish.
2. Slabs designated to receive elastomeric surfacing or seamless flooring.
3. Slabs to receive resilient flooring, carpet and similar finish materials.

3.2 PATCHING OF EXPOSED CONCRETE SURFACES

A. Areas requiring patching shall not exceed two sq. ft. per 1000 sq. ft. of surface area and shall be widely dispersed. Areas having excessive defects as determined by the Architect shall be removed and replaced.

B. Following finishing operation, patch voids, honeycomb, form tie holes and defects using a mixture of similar proportions to original concrete, deleting coarse aggregate.

C. In preparing areas to receive patch, remove loose particles and chip out adjacent sound concrete to avoid featheredge patches. Patches shall match approved patches on mock-up.

D. Apply a coating of bonding agent to areas being patched. Take care to prevent staining of exposed surfaces. Apply bonding agent in accordance with manufacturer's product data. Fill in area with selected mix, bringing to same level as original concrete. Brush out area to match surrounding work. Allow to cure.

3.3 CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperature, and maintain without drying a relatively constant temperature for the period of time necessary for hydration of cement and hardening of concrete.

B. Begin initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Keep continuously moist for not less than 72 hours.

C. Begin final curing procedures immediately following initial curing and before the concrete has dried. Continue final curing for at least 168 cumulative hours; (not necessarily consecutive) during which the concrete has been exposed to air temperatures above 50 degrees F. Avoid rapid drying at end of final curing period.

D. Curing Methods: Cure concrete by most curing, by moisture-retaining cover curing, by liquid curing compound, or by combinations thereof, except where manufactured products, in accordance with manufacturer's product data, forbid mixing certain methods.

E. Cure surfaces to receive elastomeric roofing surfacings or coatings using sodium silicate or chlorinated rubber based curing and sealing compound.

F Cure interior floor surfaces which are not designated to receive further finish with sodium silicate or chlorinated rubber based curing and sealing compound after finishing.

G. Provide moisture curing by any of the following methods:

1. Keeping surface of concrete continuously wet by covering with water.
2. Continuously water-fog spray.
3. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water, and keeping absorptive cover continuously wet.

H. Provide moisture retaining cover as follows: Cover concrete surfaces with specified moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends

lapped at least 3" and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

I. Provide liquid curing-sealing compound as follows: Apply specified membrane-forming, curing-sealing compound to damp concrete surfaces as soon as the concrete has set sufficiently so as not to be marred by the application. Areas which are subjected to heavy rainfall within three hours after initial application shall be recoated. Maintain continuity of coating and repair damage to coat during entire period.

J. Do not use membrane curing-sealing compounds on surfaces which are to be covered with a coating material applied directly to the concrete or with waterproofing, damp-proofing, flooring, paint and coatings and finish materials.

K. Cure formed surfaces of concrete, including undersides of supported slabs and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

L. Curing Unformed Surfaces

1. Initially cure unformed surfaces, such as slabs and other flat surfaces by moist curing.

2. Final cure unformed surfaces, unless otherwise specified, by any of the methods specified above, as applicable.

3.4 PROTECTION

A. Protect freshly placed concrete from damage due to water, falling objects, or persons marring finish surface of concrete. Surfaces damaged due to lack of protective measures shall be removed and replaced with fresh concrete.

B. Protect finished surfaces from damage by work of other trades due to subsequent work.

C. Protect floor surfaces to be left exposed from damage during subsequent construction operations and make necessary repairs to damaged areas, returning to original condition.

END OF SECTION 03350

SECTION 04 0120
MASONRY CLEANING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cleaning New Masonry.

B. Cleaning Existing Masonry

1.02 SUBMITTALS

A. Product Data:
   1. Submit for each cleaning agent (detergent, chemical, etc.).
   2. Submit MSDS for each cleaning agent.
   3. Submit manufacturer's detailed application instructions for proprietary cleaners.

B. Submit masonry unit manufacturer's recommendations for cleaning agents.

C. Submit a description of proposed protection of surrounding materials on building and Project site, and control of runoff during operations. Describe in detail the materials, methods, and equipment to be used.

D. If materials and methods other than those indicated are proposed for cleaning work, provide a written description, including evidence of successful use on other comparable projects, and a testing program to demonstrate their effectiveness for this Project.

1.03 QUALITY ASSURANCE

A. Mockups: Prepare field samples for cleaning procedures to demonstrate aesthetic effects and qualities of materials and execution. Use materials and methods proposed for completed Work and prepare samples under same weather conditions to be expected during remainder of Work.
   1. Clean temporary masonry mockup. Do not perform cleaning on the actual building.
   2. Locate mockups on the building where directed by Architect.
   3. After review by the Architect, prepare additional samples, adjusting materials, methods, timing, etc., as necessary to clean masonry to required finish.
      a. Test cleaners and methods on samples of adjacent materials for possible adverse reactions, unless cleaners and methods are known to have a deleterious effect.
      b. Allow a waiting period of not less than 14 days after completion of sample cleaning to permit a study of sample panels for negative reactions.
   4. Notify Architect 7 days in advance of the dates and times when samples will be prepared.
   5. Obtain Architect's approval of mockups before starting the remainder of restoration and cleaning.
   6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

1.04 DEFINITIONS

A. All pressures measured at discharge end.

B. Garden Spray: Spray of hand-pump-up garden-type (“Hudson”) sprayer with nozzle adjusted to a cone-shape. Powered garden-type sprayers providing equivalent spray are also acceptable. Stainless steel or plastic parts required (galvanized not acceptable).

C. Very-Low Pressure Spray: 30 psi (nominal) through a 3/4-inch diameter hose fitted with a nozzle producing a conical spray of approximately 60 degrees applied at a distance not closer than 4 feet from the surface. Provide pressure/volume/cut-off valve at discharge end.

D. Low-Pressure Spray: 100 to 200 psi; 4 to 6 gpm.

E. Medium-Pressure Spray: 200 to 600 psi; 4 to 6 gpm.

F. High-Pressure Spray: 600 to 1200 psi; 4 to 6 gpm.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver other materials to Project site in manufacturer's original and unopened containers, labeled with type and name of product and manufacturer.

B. Comply with manufacturer's written instructions for minimum and maximum temperature requirements for storage.

1.06 PROJECT CONDITIONS

A. Clean surfaces only when air temperature is 40 degrees F and above and will remain so for at least 7 days after completion of cleaning.

1.07 SEQUENCING AND SCHEDULING - NEW MASONRY

A. Clean masonry in a timely manner and within the time limitations recommended by the mortar manufacturer and liquid cleaner manufacturer - generally within 7 to 21 days after brick masonry is installed and within 14 to 28 days after stone masonry is installed, depending on temperature and mortar strength.

B. Perform masonry cleaning and restoration work in the following sequence:
   1. Install temporary materials where required to prevent entry of water or chemicals into interior of masonry work, windows, doors, louvers, and other openings.
   2. Protect from damage windows, doors, louvers, and other openings as well as other non-masonry surfaces that are not to be cleaned. Provide temporary masking of such surfaces where cleaners might damage such surfaces.
   3. Clean masonry surfaces.

1.08 SEQUENCING AND SCHEDULING

A. Perform masonry cleaning and restoration work in the following sequence:
   1. Install temporary materials where required to prevent entry of water or chemicals into interior of masonry work, windows, doors, louvers, and other openings.
   2. Protect from damage windows, doors, louvers, and other openings as well as other non-masonry surfaces that are not to be cleaned. Provide temporary masking of such surfaces where cleaners might damage such surfaces.
   3. Clean masonry surfaces.
   4. Rake out and repoint existing mortar from joints indicated to be repointed as specified elsewhere in Division 4.

B. Initial Cleaning: Clean existing soil, stains, efflorescence, etc., from masonry prior to demolition and performing repairs.

C. Final Cleaning: Cleaning of masonry work is complete and is required only to the extent that masonry is soiled by construction operations.

PART 2 PRODUCTS

2.01 SUBSTITUTIONS

A. Refer to Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Water: clean, potable water.

B. Warm water for mixing cleaning solutions.

C. pH paper with 3 colors to identify numeric pH level.

2.03 MIXES

A. Liquid Cleaners: ProSoCo, Incorporated.

2.04 TEMPORARY COVERS

A. Liquid Strippable Masking Agent: Manufacturer's standard liquid, film-forming, strippable masking material for protecting glass, metal, and polished masonry surfaces from the damaging effects of acidic and alkaline masonry cleaners.

B. Polyethylene Sheet.

C. Adhesive Tape: Non-staining, leaving building surface residue-free after tape is removed.

PART 3 EXECUTION

3.01 PROTECTION

A. The Building: Where cleaners and rinses have not been demonstrated to be non-deleterious to non-masonry portions of the building, provide temporary masking of non-masonry surfaces.

B. Control of Runoff:
   1. Do not allow cleaners and rinses to collect, pond, or form soft muddy conditions at the base of the building that do not dissipate within 24 hours.

C. Protection of Vegetation: A portion of the existing plant life is indicated elsewhere in the Contract Documents to be removed. Do not allow cleaners and rinses to contact vegetation to remain.

D. If inadvertent spills of cleaner contact vegetation or other building elements, rinse immediately with potable water until free of cleaner.

E. Do not apply sprays during windy conditions sufficient to carry overspray into contact with other surfaces, vegetation, or people.

3.02 CLEANING STANDARD REQUIRED:

A. General:
   1. Clean masonry to remove mortar scum and mortar droppings.
   2. Degree of cleanliness in the Work shall match that achieved in the approved mock-ups.

3.03 CLEANING, GENERAL

A. Identify “panels” of the building to be cleaned sequentially.

B. Proceed within each panel from the base of the building to the top, unless otherwise approved.

C. Prewetting:
   1. As cleaning proceeds upwardly, maintain lower portions and immediately adjacent portions continuously wet and streak-free and soil-free.
   2. Extend the wetted area horizontally beyond the immediate area to be cleaned.
   3. Wet the area beneath the area to be cleaned, from grade level up to the area to be cleaned.
   4. Maintain these adjacent areas wet with water until rinsing is complete to avoid streaking and deposition of cleaners and residues onto adjacent surfaces.

D. Thoroughly remove cleaners by rinsing with potable water. A final rinse shall be performed from the top of the building down to the base of the building.

E. Clean building surfaces in a uniform manner. Include flat surfaces, cornices, moldings, ornament, recesses, tops and undersides, etc., to produce a uniformly clean result.

F. Do not apply different cleaners on a given area unless the cleaner used previously has been thoroughly washed away.

G. Adjustments to meet Project Conditions:
   1. Repeat cleaning procedures or adjust dwell times or adjust the amount or type of scrubbing effort or adjust concentration of cleaners (or a combination the preceding), depending upon the amount and type of soil or stain present on the various parts of the building, and so as to achieve a uniformly clean result and without change in Contract Time or Price.
   2. Obtain the Architect's approval of such adjustments.
   3. Do not exceed concentrations or dwell times or repeat procedures beyond the limits specified or approved by the Architect.

3.04 SPRAYS

A. Do not use power-assisted spray without the written authorization of the Architect.

B. Provide very low pressure spray, taking water from hose bibbs to portions of the building required to be cleaned.

C. If the Architect determines that unassisted pressure at hose-end from the building water supply does not provide adequate pressure or volume, provide power-assisted spray adjusted to simulate very-low pressure spray without change in Contract Time or Price. Obtain the written authorization from the Architect.

D. If the Contractor so requests and the Architect determines that due to remote location or configuration or other Project factors, it is impracticable to use hoses to rinse selected portions, provide power-assisted spray adjusted to simulate very-low pressure spray without change in Contract Time or Price. Obtain the written authorization from the Architect.

3.05 APPLICATION OF LIQUID CLEANERS

A. Remove as much plant growth as possible using a knife blade and stiff bristle brush. Dry-brush the surface before wetting to remove bulk growth.
   1. Pre-wet the area to be cleaned (and the adjacent areas) with a water spray.
      a. Extend the wetted area horizontally beyond the immediate area to be cleaned.
      b. Wet the area beneath the area to be cleaned, from grade level up to the area to be cleaned.
      c. Maintain these adjacent areas wet with water until rinsing is complete to avoid streaking and deposition of cleaners and residues onto adjacent surfaces.
   2. Apply the solution to the affected area using either a garden spray or medium-stiff natural bristle brush. Use large, flat brushes for flat areas; use small brushes to access recesses, reveals, and detail of ornament.
      a. Scrub with a natural or artificial bristle brush and allow to dwell as necessary depending on degree of soiling and application temperatures.
      b. Dwell times are estimated to be 20 to 30 minutes between 40 and 70 degrees F, and 10 to 15 minutes at 70 degrees F and above, but may range up to an hour or longer depending upon degree of soiling, scrubbing effort, and other factors. Consult manufacturer for required dwell time for the product being used.
      c. Do not allow cleaners to dry out. Reapply cleaner or mist with water to keep the surface saturated, and scrub periodically until the growth, stain, or soil is removed.
   3. After-Wash:
      a. Thoroughly rinse cleaner from surface with low-pressure spray water.
      b. Immediately apply after-wash to surface and allow to dwell for 3 to 5 minutes.
   4. Thoroughly rinse the surface with low-pressure spray water.

a. Test liquid rinse run-off drops with pH paper to ensure that ensure that cleaning solutions have been effectively removed. Continue rinsing until pH is neutral. (pH testing of liquid detergent is not required or effective.)
b. Allow to dry.
c. Test as often as necessary to ensure reliable, repeatable results and when otherwise requested by the Architect.

5. Use prepared solutions within 24 hours.

END OF SECTION

SECTION 04 2000
UNIT MASONRY ASSEMBLIES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Concrete Block.
   2. Clay or Shale Facing Brick.
   3. Mortar and Grout.
   4. Reinforcement and Anchorage.
   5. Accessories.

B. Products Installed but not Furnished Under this Section, Including, but not Limited to:
   1. Items specified elsewhere and which are built into masonry.
   2. Lintels.
   3. Frames for openings.
   4. Anchors for built-in items.
   5. Inserts and connectors.
   6. Utility items.

1.02 REFERENCES

A. ACI 530 - Building Code Requirements for Masonry Structures; 2005.

B. ACI 530.1 - Specification for Masonry Structures; 2005.

C. ASTM A 580/A 580M - Standard Specification for Stainless Steel Wire; 2006.

D. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 2007.

E. ASTM A 951 - Standard Specification for Masonry Joint Reinforcement; 2006.

F. ASTM C 67 - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile; 2007a.

G. ASTM C 90 - Standard Specification for Loadbearing Concrete Masonry Units; 2006b.

H. ASTM C 114 - Standard Test Methods for Chemical Analysis of Hydraulic Cement; 2007.

I. ASTM C 140 - Standard Test Methods of Sampling and Testing Concrete Masonry Units and Related Units; 2007a.

J. ASTM C 144 - Standard Specification for Aggregate for Masonry Mortar; 2004.

K. ASTM C 150 - Standard Specification for Portland Cement; 2007.

L. ASTM C 207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2006.

M. ASTM C 216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale); 2007a.

N. ASTM C 404 - Standard Specification for Aggregates for Masonry Grout; 2007.

O. ASTM C 476 - Standard Specification for Grout for Masonry; 2007.

P. ASTM C 979 - Standard Specification for Pigments for Integrally Colored Concrete; 2005.

Q. “Standard Practice for Bracing Masonry Walls Under Construction”, Council for Masonry Bracing.

1.03 DEFINITIONS

A. As listed in ACI 530 and 530.1.

B. "To match existing building": No visible difference when viewed by the Architect as specified under "Appearance of Completed Masonry" at the end of this Section. The Architect's approval of initial product submittals, sample panels, etc., is preliminary only. Final approval shall be on the basis on in-place mock-ups and permanent work.

1.04 SUBMITTALS

A. Product Data:
   1. Masonry units.
   2. Cementitious materials.
   3. Reinforcing steel.
   4. Joint reinforcement.
   5. Anchors.
   6. Accessories.

B. Test Reports:
   1. Masonry units: Net area compressive strength.
      a. Where less that 50,000 sf of masonry is required, submit test results of net area compressive strength of units based on standard plant runs.
      b. Where 50,000 sf or more of masonry is required, submit test results of net area compressive strength of units based on actual lots produced for the project, and tested at least once per 50,000 sf.
   2. Sand: Sieve analysis and aggregate void ratio. Perform test within 60 days of submittal.
   3. Mortar:
      a. Mix design: Proportions of each material by volume.
      b. Mortar test results (trial mix).
   4. Grout Mix Design:
      a. Proportions of each material.
      b. Compressive strength test results.

C. Office Samples:
   1. Mortar: 2-inch samples.
   2. Masonry units demonstrating full range of color and texture.

D. Proposed hot and cold weather procedures.

1.05 BRICK AND MORTAR SAMPLE PANELS

A. Where new work is specified to match a stated color:
   1. Prepare sample panel demonstrating proposed mortar color and masonry units.
   2. Construct panel on site in a location designated by the Architect.
   3. Size: 4 feet high by 4 feet wide, plus a portable sample 5 courses high by 2 feet wide.
   4. The appearance of mortar, joint work, and masonry units in the sample panel will be evaluated by the Architect in accordance with "Appearance of Completed Work" at the end of this Section.

B. If a sample panel is not approved, make appropriate adjustments and construct additional panels.

1.06 MOCK-UP

A. Construct mock-ups in the presence of the Architect.

B. Mock up each type of masonry work and obtain the Architect's approval before proceeding with full production.

C. Include the following:
   1. Foundation.
   2. All components of back-up.
   3. Reinforcing.
   4. Studs.
   5. Sheathing.
   6. Weather resistant membrane or barrier.
   7. Insulation.
   8. Anchors.
   9. Veneer.
   10. Window.
   11. Lintel.
   12. Flashing, cleanouts, and weeps.

D. Construct mock-ups on separate, temporary foundations in locations on the site identified by the Architect.
   1. Mock-ups shall not remain as a part of permanent work. Remove from the site when directed by the Architect.

1.07 PRE-INSTALLATION MEETING

A. Convene one week before starting work of this section.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Do not allow materials to become damaged or contaminated by other materials.

B. Provide on-site storage of masonry units required for not less than 4 weeks production.
   1. Store units raised above ground on pallets or similar flooring to prevent moisture pick-up.
   2. Store units under cover to prevent moisture pick-up from rain or snow.
   3. Do not tarp or wrap units so as to trap moisture or to permit condensation to form.
   4. Allow air to circulate freely around units.
   5. Use only masonry units that have been stored thus for not less than 3 weeks.

C. Sand:
   1. Maintain sand at a constant moisture content.
   2. Cover pile when not in use.
   3. Arrange pile for free drainage.
   4. Do not use the bottom portion of the pile (wet or in contact with earth) in mortar.
   5. At Contractor's option use bagged, kiln-dried sand.

D. Cement and Lime:
   1. Store materials raised above ground on pallets or similar flooring to prevent moisture pick-up.
   2. Store materials under cover to prevent moisture pick-up from rain or snow.
   3. Do not tarp or wrap materials so as to trap moisture or to permit condensation to form.
   4. Allow air to circulate freely around units.
   5. Do not use bags that have been broken or exposed to moisture.

1.09 PROJECT SITE CONDITIONS

A. Cold Weather Requirements. When either the ambient air temperature or the temperature of masonry units is below 40ºF:
   1. Submit proposed procedures to the Architect.
   2. Materials:

a. Ensure that temperature of masonry units is greater than 20ºF when laid in the masonry.
b. Remove visible ice from masonry units before laying in the masonry.
c. Heat mortar sand or mixing water to produce mortar temperatures between 40ºF and 120ºF at the time of mixing. Maintain mortar above freezing until used in masonry.

3. Protection when laying masonry:
   a. Use heat sources when ambient temperature is between 20ºF and 25ºF on both sides of the masonry under construction.
   b. Provide wind breaks when wind velocity is in excess of 15 mph.
   c. When ambient temperature is below 20ºF, provide temporary enclosure for the masonry under construction and provide temporary heat to maintain temperature above 32ºF within the enclosure.
4. Protection after laying masonry:
   a. When mean daily temperature (average of high and low) is between 32ºF and 40ºF, protect completed masonry from rain or snow by covering with a weather-resistant membrane for 24 hours after construction.
   b. When mean daily temperature (average of high and low) is between 25ºF and 32ºF, completely cover completed masonry with a weather-resistant membrane for 24 hours after construction.
   c. When mean daily temperature (average of high and low) is between 20ºF and 25ºF, completely cover completed masonry with insulating blankets for 24 hours after construction.
   d. When mean daily temperature (average of high and low) is below 20ºF, maintain the temperature of masonry above 32ºF for 24 hours after construction by providing temporary enclosure with temporary heat, by providing electric heating blankets or infrared heat lamps, or by other approved methods.

B. Hot weather construction.
1. Submit proposed procedures to the Architect.
2. Preparation. The following requirements shall be met prior to conducting masonry work.
   a. Temperature. When the ambient temperature exceeds 100ºF (38ºC), or exceeds 90ºF (32ºC) with a wind velocity greater than 8 mph (13 km/h):
      1) Necessary conditions and equipment shall be provided to produce mortar having a temperature below 120ºF (49ºC).
      2) Sand piles shall be maintained in a damp, loose condition.
   b. Special conditions. When the ambient temperature exceeds 115ºF (46ºC), or 105ºF (40ºC) with a wind velocity greater than 8 mph (13 km/h), observe the above requirements and in addition, provide shade so that direct sunlight does not fall on materials and mixing equipment.
3. Construction. The following requirements shall be met while masonry work is in progress.
   a. Temperature. When the ambient temperature exceeds 100ºF (38ºC), or exceeds 90ºF (32ºC) with a wind velocity greater than 8 mph (13 km/h):
      1) The temperature of mortar and grout shall be maintained below 120ºF (49ºC).
      2) Mixers, mortar transport containers and mortar boards shall be flushed with cool water before they come into contact with mortar ingredients or mortar.
      3) Mortar consistency shall be maintained by retempering with cool water. Do not retemper colored mortar.
      4) Mortar shall be used within 2 hours of initial mixing.

b. Special conditions. When the ambient temperature exceeds 115ºF (46ºC), or exceeds 105ºF (40ºC) with a wind velocity greater than 8 mph (13 km/h), observe the above requirements and in addition cool mixing water used for mortar and grout. The use of ice shall be permitted in the mixing water prior to use. Ice shall not be permitted in the mixing water when added to the other mortar or grout materials.

4. Protection. When the mean daily temperature exceeds 100ºF (38ºC), or exceeds 90ºF (32ºC) with a wind velocity greater than 8 mph (13 km/h), newly constructed masonry shall be fog sprayed until damp at least three times a day until the masonry is three days old.

PART 2 PRODUCTS

2.01 SUBSTITUTIONS

A. Refer to Section 01 6000 - Product Requirements.

2.02 CONCRETE MASONRY UNITS

A. Load Bearing Units: ASTM C 90
   1. Average net area compressive strength of units, ASTM C 140: At least 2,150 psi.
   2. Hollow block.

B. Provide specially shaped units where required by project conditions, including but not limited to:
   1. Corner block: Square.
   2. At control joints: Sash block.
   3. Lintels.
   4. Bond beams.

C. Nominal Face Size: 8 by 16 inches, unless otherwise indicated on the drawings.
   1. Nominal Thickness: As indicated on the drawings.

2.03 CLAY OR SHALE MASONRY UNITS

A. Face Brick: ASTM C 216.
   1. Average net area compressive strength of units, ASTM C 67: At least 4,150 psi.
   2. Grade SW.

B. Nominal Size: 4 by 8 by 2-2/3 inches.

C. Provide specially extruded or molded units where specially shaped units are required by project conditions.
   1. Special shapes sawn from standard units will be permitted where the sawn face is not exposed to view or to weather.

D. Provide 100% solid units (no cores) in the following locations: As indicated on the drawings
   1. In courses where flashing will be placed directly on masonry.

2.04 MORTAR MATERIALS

A. Deliver cementitious materials to the job site in bags containing factory proportioned quantities of cement, lime, and pigment in each bag according to the approved design mix, unless an alternate method of batching is approved by the Architect. Manufacturer's label on each bag shall clearly indicate compliance with this specification. Labels bearing the words “masonry cement” shall in addition bear the words “portland-lime” or other clear indication of compliance with this specification.

B. Portland Cement: ASTM C 150, Type I.

1. For exposed masonry provide white cement containing not more than 0.60 percent total alkali when tested according to ASTM C 114.
2. Masonry Cement and Mortar Cement are not acceptable.

C. Hydrated Lime: ASTM C 207, Type S.

D. Mortar Aggregate: ASTM C 144.

E. Grout Aggregate: ASTM C 404.

F. Pigments for Colored Mortar: Iron or chromium oxides with demonstrated stability and colorfastness and complying with ASTM C 979.
1. Mortar for masonry exposed to view, after curing the specified length of time, shall match the color of the sample on file in the office of the Architect.
2. Note: Product name is for color matching, only, and does not indicate the type or brand of mortar to be furnished.

G. Water: Clean and potable.

2.05 REINFORCING AND ANCHORS

A. Reinforcing Steel:
1. ASTM A 615, Grade 60, deformed, plain finish.

B. For the materials below, provide products of one of the following:
1. Blok-Lok.
2. Dur-O-Wal.
3. Heckmann
4. H & B

C. For the reinforcing and anchoring products below, provide the following material:
1. Exterior walls (all wythes):
a. Stainless steel ASTM A 580, Type 304.

D. Bar Positioners:
1. Blok-Lok.
2. Dur-O-Wal “D/A 812, 811, 816”.
3. Heckmann "376, 377, 378".
4. H & B "#RB, #RB-Twin"

E. Joint Reinforcement: ASTM A 951.
1. Side wire size: W1.7 (No. 9).
2. Cross wire size: W1.7 (No.9).
3. Configurations:
a. CMU backup for clay or shale brick veneer:
1) Ladder type, 1 side rod per face shell; between 5/8 inch and 1 inch mortar coverage at each face.
2) Adjustable veneer anchors, wire size W2.8 embedded into veneer at least 1-1/2 inches and extending not closer than 5/8 inch from the exposed face.
3) Blok-Lok Blok-Lok "Adjustable Econo-Cavity Lok II BL42" with "Wedge-Lok" insulation retainers.
4) Dur-O-Wal “D/A 360 Ladur-Eye”.
5) Heckmann
6) H & B "Lox-All Ladder Type #270".

F. Anchoring CMU to Structural Frame:

G. Masonry Veneer Anchors:

1. Sized for embedment into veneer at least 1-1/2 inches and extending not closer than 5/8 inch from the exposed face.
2. Clearance between tie and base parts: Not more than 1/16 inch.
3. Over stud back-up (with or without insulation in the masonry cavity):
   a. Blok-Lok #BL407.
   b. Dur-O-Wal D/A 213.
   c. Heckmann "#213 plus #282".
   d. H & B "#HB200".
4. Over stud back-up where no insulation occurs in the masonry cavity: 12 gage base plate, 6 inches nominal long; 3/16 inch diameter triangular wire tie; 3 inches nominal vertical adjustment.
   a. Blok-Lok BL-210.
   b. Dur-O-Wall DA-210.
   c. Heckmann #315-D.
   d. H & B DW-10HS.
5. Self-Adhesive Sheet Membrane for use under veneer anchors installed on sheathing and stud back-up:
   a. Self-adhesive butyl or rubberized asphalt sheet membrane specified in weather-resistant barrier Section in Division 7.
6. Over CMU back-up: Joint reinforcement with adjustable ties (specified above).

2.06 FLASHINGS

A. Receivers and Counterflashing: Specified in Section 07 6200.

B. Flashing Materials: Self-adhesive sheet membrane, as specified in Section 07 6500.

2.07 ACCESSORIES

A. Control Joint Filler: Rubber shear key, width 1" nominal less than wythe.
   1. Blok-Lok.
   2. Dur-O-Wal D/A 2003, 2005, 2007.
   3. Heckman "#352".
   4. H & B "#RS".

B. Expansion Joint Filler: Soft, closed cell neoprene rubber. Thickness 3/8 inch vertical joints, 1/4 inch horizontal joints. Depth equal to wythe less 3/8 inch.
   1. Blok-Lok.
   2. Dur-O-Wal Rapid Soft-Joint, Expansion Joint.
   3. Heckmann
   4. H & B "#NS Closed-Cell Neoprene Sponge".

C. Weeps and Vents: UV resistant polypropylene.
   1. Blok-Lok.
   2. Dur-O-Wal Cell Vent D/A 1006.
   3. Heckmann "#85 Cell Vent".
   4. H & B "#QV Quadro-Vent".

D. Confinement Mesh: Inert, non-corrosive mesh to confine grout while maintaining bond with mortar.
   1. Blok-Lok.
   2. Dur-O-Wal Dur-O-Stop.
   3. Heckmann "#267".
   4. H & B "#MGS-Mortar/Grout Screen".

2.08 MIXING

A. Mortar for Clay or Shale Unit Masonry: ASTM C 270, Portland cement / lime proportion specification; masonry or mortar cement not permitted; Type N.

B. Mortar for Concrete Unit Masonry: ASTM C 270, proportion specification; Type N unless otherwise indicated on the structural drawings.

C. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio or that permitted by ACI 530.1.

D. Mixing Setting Mortar:
   1. Use a paddle type mechanical batch mixer.
   2. Use a positive means of measuring volumes of ingredients. Each batch shall contain a known volume of each ingredient. Measuring by shovels is not acceptable.
   3. Mix batches using whole sacks of cementitious materials unless another method of equivalent accuracy is approved by the Architect.
   4. Do not mix partial batches. Discard unused mix.
   5. Use mortar as soon as possible.
   6. Mortar that loses water by evaporation shall be retempered by the addition of water to restore its original consistency, providing the mortar has not begun to set.
   7. Do not re-temper colored mortar.
   8. Discard mortar that has begun to set.
   9. Discard mortar that has not been used after 2-1/2 hours after original mixing.

E. Mixing order when lime and cement are bagged together (confirm with manufacturer and notify Architect if manufacturer’s instructions differ):
   1. Water: 75% of total.
   2. Sand: Half.
   3. Lime and cement: All.
   4. Sand: Balance.
   5. Water: To a workable consistency.
   6. Mix: Not less than 3-1/2 nor more than 5 minutes after the introduction of cementitious material.

F. Mixing order when lime and cement are bagged in two separate bags:
   1. Water: 75% of total.
   2. Sand: Half.
   3. Lime: All.
   4. Mix: 2 minutes.
   5. Portland Cement: All.
   6. Sand: Balance.
   7. Water: To a workable consistency.
   8. Mix: 5 full minutes.

G. Grout: ASTM C 476.
   1. Compressive strength, ASTM C 1019: As indicated on the structural drawings, or if not indicated, provide grout complying with the proportions of Table 1, ASTM C 476.
   2. Slump, ASTM C 143: 8 to 11 inches.
   3. Fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

H. Mixing Grout: Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C 476 for fine and coarse grout.

2.09 FABRICATION OF REINFORCING STEEL

A. Shop-fabricate reinforcing steel in compliance with ACI 530 and 530.1.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions:
   1. Verify that reinforcing dowels are properly positioned.
   2. Verify that items to be built-in such as pipes, conduit, boxes, and other items are properly positioned and do not interfere with masonry or reinforcing.
   3. Verify that non-masonry structural elements such as foundations for masonry, columns, beams, floor slab edges are properly positioned and do not interfere with masonry or required cavity.
   4. Verity that field measurements of project conditions allow for proper coursing both vertically and horizontally, unless otherwise required by the contract documents. Notify the Architect of non-coursing conditions.

B. Ensure that as-built field tolerances of other trades will permit the proper construction of masonry.

C. Bearing and Cavity Width:
   1. Do not allow cavity widths to exceed 4-1/4 inches nor to be less than 1-1/2 inches.
   2. Do not allow clay or shale brick to bear on less than 2/3 of their actual width.
   3. Do not allow hollow CMU to bear on less than their full width

D. Ensure that materials to be covered by masonry (such as steel studs, sheathing, insulation, membrane flashings, damproofing, etc.) are complete and have been inspected and approved before covering with masonry.

E. As masonry construction progresses and before covering flashings with masonry, verify that flashings are properly located, sealed watertight, and constructed so as to direct water to the outside.

F. Where conditions are not compliant, notify the Architect before beginning masonry construction.

G. Provide corrected conditions before beginning masonry construction.

3.02 PREPARATION

A. Temporarily brace masonry until permanent bracing is provided.

B. Brace masonry in accordance with “Standard Practice for Bracing Masonry Walls Under Construction,” Council for Masonry Bracing.

C. Clean reinforcing steel when required by ACI 530.1.

3.03 PLACING UNITS

A. Solid units:
   1. Ensure bed and head joints are full of mortar without voids.
   2. Bevel bed joints with an appropriate quantity of mortar to fully fill the bed joint without overfilling, and without forcing excess mortar into the cavity or onto the face of units.
   3. Do not furrow bed joints.
   4. Place mortar on the head of the unit prior to placing, and shove into place.
   5. Do not slush head joints.

B. Hollow Units:
   1. Construct with fully mortared face shells.
   2. Construct fully mortared web joints:
      a. At the first course of bearing.
      b. All courses of columns, piers, and pilasters.
      c. Perimeter of grouted construction.

C. Ensure that units are in final position and adjusted to line, level, and plane before 60 seconds have expired since mortar contact with unit. Do not disturb units after this time. If further adjustment is required, remove unit and mortar and install fresh unit and mortar. Removed units may be reused if cleaned promptly and allowed to dry 24 hours before reuse.

D. Strike-off extruded mortar from the face and rear of the unit using a lifting and cutting motion of the trowel. Avoid dropping mortar in the cavity. Do not smear of mortar on the face of units.

3.04 COURSING AND JOINTING

A. Place units in running bond, unless otherwise indicated.

B. Do not tooth masonry. Rack masonry 1 unit per course where masonry is not laid continuously.

C. Joint thickness: 3/8 inch. Construct joints of uniform thickness.
   1. Exception: Bed joint at foundations: Not less than 1/4 nor more than 3/4 inch.
   2. Exception: Where stretching or compressing joints is necessary to accommodate dimensional tolerances or other conditions, consult with the Architect to determine acceptable tolerances.

D. Expansion Joints in Clay or Shale Masonry:
   1. Ensure that expansion joints are free of mortar and other obstructions.
   2. Place compressible expansion joint filler at proper depth to receive joint sealant.

E. Control Joints in Concrete Masonry:
   1. Construct control joints using sash block and control joint filler topped with joint sealant specified in Division 7.

F. Joint Shape:
   1. Concave, unless otherwise indicated.

G. Openings: Construct masonry openings for windows, doors, and penetrations to allow for proper sealant joint width between masonry and other material.
   1. Joint width adjacent to openings: 3/8 inch unless otherwise indicated on the drawings.

H. Where walls and partitions abut columns or other construction:

I. Where differing exterior masonry materials meet (brick, CMU, cast stone, precast concrete, cast-in-place concrete, etc.), rake back mortar to receive joint sealant specified in Division 7.

3.05 VENEER

A. Before constructing veneer, verify that spacing of veneer anchors in back-up is as specified.

B. Where built-in items such as pipes, conduit, boxes, and other items occur, ensure that such items do not interfere with proper cavity drainage. If such occur, consult with the Architect and provide custom flashing or other measures as approved.

3.06 CLEANOUTS AND WEEPS

A. Clay or Shale Masonry: Provide cleanouts at each flashing elevation, spaced 24 inches on center. Clean out accumulated mortar droppings from the cavity before mortar hardens

throughout each work day and at the end of each work day. Provide specially shaped tools and "shop-vacuum" equipment if necessary to achieve a mortar-free cavity.

B. Obtain the Architect's approval before permanently closing cleanouts.

C. Install weep devices at 24 inches on center.

D. Ensure that plastic weep device is seated on flashing - not held above flashing by mortar.

E. Three courses below flashings, install vent devices at 24 inches on center, offset 12 inches horizontally from weeps above.

3.07 REINFORCING STEEL

A. Secure reinforcing steel against displacement prior to grouting.

B. Locate vertical bar positioners at the following locations:
   1. At the top of the first course.
   2. One course below the top of wall or partition.
   3. Not more than 4 feet vertically between positioners.

C. Provide at least 1/4 inch fine grout cover or 1/2 inch coarse grout cover between steel and adjacent masonry unit or formed surface.

D. Placement tolerance: As specified in ACI 530.1.

E. Do not bend reinforcing on site or after placement without the Architect's approval.

3.08 GROUTING

A. Construct cleanouts in accordance with ACI 530.1.

B. Ensure that inside face of cells or cavities aligned, and unobstructed by interior offsets of more than 1/2 inch.

C. Confine grout within intended spaces.

D. Place grout in accordance with ACI 530.1.

3.09 HORIZONTAL JOINT REINFORCEMENT IN CMU

A. Reinforce all CMU walls and partitions.

B. Lay joint reinforcement directly on masonry units and cover with mortar. Provide mortar cover specified in Part 2.

C. Lap joint reinforcement at least 6 inches.

D. At corners and intersecting walls, install joint reinforcement with prefabricated corners and tees.

E. Vertical Spacing:
   1. 16 inches on center, unless otherwise indicated.
   2. Prefabricated units at corners and intersecting walls, 8 inches on center. Extend legs at least 30 inches in each direction.
   3. First 2 courses above and below openings. Extend at least 16 inches beyond each side of opening.
   4. First 2 courses below the tops of walls.
   5. Parapets: 8 inches on center.

F. Do not continue horizontal joint reinforcement through control joints.

3.10 VENEER ANCHORS

A. Where veneer is attached to sheathing and stud substrates, install self-adhesive sheet membrane at each location to receive a veneer anchor. Press entire surface area of sheet firmly against

substrate using 4 to 6 inch wide steel hand roller. Continue pressing and rolling until entire sheet is well bonded to substrate. Place anchor on top of sheet membrane and fasten through to stud. Size sheet material to extend approximately 1/2 inch beyond the edges of the anchor. Ensure that the anchor, securely fastened, forms a tight compression seal against sheet material and weather membrane to form an air-tight and weather-tight seal. Where sheet material would not form a practicable seal around penetrations, seal such penetrations with mastic (product acceptable to the air barrier manufacturer) to form an air-tight and weather-tight seal.

B. Space anchors as follows:
   1. Not more than 2.67 sf of wall area per anchor.
   2. Not more than 18 inches vertically.
   3. Not more than 32 inches horizontally.
   4. Openings larger than 16 inches in either direction: Install additional anchors within 12 inches of opening, spaced at not more than 36 inches on center.
   5. Locate the first row of anchors not more than 16 inches above bearing elevation.
   6. Locate the last row of anchors not more than 8 inches below the top of masonry panel (top of parapet, top of wall, underside of structure, below shelf angle, etc.).
   7. Where veneer corners are not masonry bonded (an expansion joint occurs at the corner), locate the first column of anchors within 12 inches of outside face of masonry in both directions.
   8. Where veneer corners are masonry bonded (no expansion joint at the corner), locate the first column of anchors within 16 inches of the outside face of masonry in both directions.

C. Install adjustable anchors to allow for expansion of clay or shale masonry and contraction of back-up.

3.11 MASONRY FLASHING

A. Specified in Division 7.

3.12 OTHER MATERIALS

A. Build-in items specified elsewhere including, but not limited to:
   1. Lintels.
   2. Door frames. Fill hollow metal frames with grout.
   3. Window frames.
   4. Frames for openings.
   5. Anchors for built-in items.
   6. Inserts and connectors.
   7. Utility items.

B. Simultaneously construct chases and contiguous walls or partitions.

C. Do not embed wood (whether or not preservative treated) or other organic materials.

D. Do not embed aluminum that has not been coated with an approved anti-corrosion coating.

3.13 POINTING

A. Raking of Existing Joints to be Repointed:
   1. Remove unsound mortar in joints until sound moral is reached, and in no case less than 5/8 inch depth.
   2. Rake joints with hand tools unless a mock-up using power tools without damage to masonry is approved by the Architect.
   3. Do not damage masonry units.
   4. Brush joints to remove dust and debris before pointing.

B. Pointing:
   1. Use pointing tools of proper width. Do not use trowels.
   2. Premoisten joint with a water mist before applying mortar
   3. Adjust pointing technique to ensure complete, void-free filling of joints.
   4. Compact each layer at the time it is placed in the joint by applying firm pressure with the pointing tool.
   5. Allow each lift to become thumbprint hard before applying the next lift.
   6. Install the initial lifts of the entire bay before installing the final lift of 5/8 inch.
   7. Fill final lift to permit proper striking and finishing of joint.

C. Finishing Joints: When mortar is thumbprint hard the joints shall be finished by striking the mortar with a tool leaving the finished joint recessed to match adjacent joints.
   1. Finish joints uniformly. Do not overwork.
   2. Match appearance of adjacent mortar joints.

3.14 TOLERANCES

A. Conform to both code and visual tolerances.

B. Code Tolerances: As specified in ACI 530.1.

C. Appearance of Completed Work: Variations in dimension, joint thickness, plumb, plane, line, alignment, offset, location in plan or elevation, etc., that are visible to the Architect under the criteria below shall be considered defective and shall, if ordered by the Architect, be corrected even though such conditions may fall within the tolerances specified in ACI 530.1.
   1. The Architect will view the completed masonry to approve or reject the color consistency of the mortar, cleanliness of the masonry, and other aesthetic aspects of the work.
   2. If the Contractor so requests, an initial determination will be made at not earlier than 2 weeks of age.
   3. The Architect is the sole judge of aesthetic effect.
   4. Initial approval will be given as a part of periodic site visits.
   5. Final approval will be given only after scaffolding is removed and not earlier than 4 weeks after masonry has been laid.
   6. Criteria for acceptance: Masonry shall be free of objectionable variations in color of the mortar, cleanliness of the new masonry, or other defective aesthetic effects. Lippage, or cocked or tilted brick are not acceptable.
   7. Conditions for approval of completed appearance: Work will be viewed under normal daylight from a distance of 20 feet (or more at the Architect's discretion), except in those areas where work occurs adjacent to entrances and walking surfaces, which will be viewed at close hand.
   8. Variations from Code tolerances and defects that affect serviceability are not limited by viewing distance.

3.15 IN PROGRESS CLEANING

A. Arrange means, methods, and techniques of construction masonry and the work of other trades to avoid and prevent the soiling or staining of in-progress and completed masonry.

B. On-site Storage:
   1. Protect masonry units from soil and mud.
   2. Store units on pallets or equivalent to raise units above ground or place on well drained hard pavement. Do not place units directly on the ground.
   3. Cover units with tarps to keep out precipitation. Ventilate tarps at the base to allow air circulation and to avoid condensation.

C. Protection:
   1. Protect the base of masonry after the first course is laid. Use sand, straw, sawdust, plastic sheeting, etc., to prevent stains from mud and soil. Ensure proper drainage at base of wall to avoid retaining water and muddy conditions.
   2. Cover the top of masonry with waterproof coverings at the end of each work day. Covers shall drape vertically at least 6 inches down inside and outside face of masonry. Secure covers against blowing wind.
   3. Set scaffold far enough from the wall to allow mortar droppings to fall to the ground without staining completed masonry. At the end of each work day remove or tilt up scaffold board nearest the wall to dump mortar droppings and to prevent rainfall from splattering mortar from the board to newly constructed masonry.

D. Laying Masonry:
   1. After spreading bed joint mortar and before placing brick, cut mortar from the wall face with the edge of a trowel to prevent mortar running down the wall.
   2. After units are laid, cut off excess mortar, capturing it with the trowel so as not to allow excess to drop down the face of the wall.

E. After Completion:
   1. Do not allow other trades to stain or soil completed masonry. Provide protection to avoid staining or soiling.
   2. Keep mud protection at the base of masonry until permanent landscaping is completed and viable, effective groundcover is well established.

F. Tooling:
   1. Tool joints when they are thumbprint hard.
   2. Tool joints at about the same "age" from lift to lift of masonry, from section to section of masonry, from day to day, and from crew to crew.
   3. Tool joints with a consistent technique.
   4. Then cut off mortar tailings with a trowel and, using a medium soft hair bricklayer’s brush, brush mortar burrs and dust from the face of units.
   5. At the start of work each morning, remove any remaining excess mortar from the face of units with a wire brush.

G. Non-Compliance with any of the above provisions is defective workmanship and grounds for rejection.

3.16 FINAL CLEANING

A. Specified in Section 04 0120.

END OF SECTION

SECTION 04 4301
STONE MASONRY VENEER

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Full-height drain mat behind stone.
   2. Mortar.
   3. Grout.

1.02 REFERENCES

A. ACI 530.1 - Specification for Masonry Structures; 1999.

B. ASTM C 143/C 143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2005a.

C. ASTM C 144 - Standard Specification for Aggregate for Masonry Mortar; 2002.

D. ASTM C 150 - Standard Specification for Portland Cement; 2002a.

E. ASTM C 207 - Standard Specification for Hydrated Lime for Masonry Purposes; 1991 (Reapproved 1997).

F. ASTM C 270 - Standard Specification for Mortar for Unit Masonry; 2002.

G. ASTM C 404 - Standard Specification for Aggregates for Masonry Grout; 1997.

H. ASTM C 476 - Standard Specification for Grout for Masonry; 2002.

1.03 SUBMITTALS

A. Product Data: Manufacturer's technical data for:
   1. Each type of stone.
   2. Cementitious materials.
   3. Sand: Sieve analysis.
   4. Mortar mix design: Proportions of each material by volume.
   5. Drain mat.
   6. Weeps.

B. Samples:
   1. Stone sample sets:
      a. Set: multiple pieces 12 by 12 inches, showing the complete range of color and pattern variations to be provided.
      b. Submit sets for each type, variety, grade, color, and finish of stone.

1.04 MOCK-UPS

A. Construct mock-ups in the presence of the Architect.

B. Mock up each type of stone work and obtain the Architect's approval before proceeding with full production.

C. Include the following:
   1. All components of back-up.
   2. Insulation.
   3. Anchors.
   4. Window.
   5. Lintel.
   6. Flashing.

1.05 PROJECT SITE CONDITIONS

A. Protect stonework from precipitation.
   1. Cover tops of walls with waterproof membrane at end of work each day. Cover whenever work is not in progress. Cover at least 24 inches down each side; fasten in place.
   2. Prevent staining of stone from all sources; immediately remove materials which could cause stains, without damaging stone.
   3. Protect bases of walls from mud spatter.
   4. Protect projecting stonework from mortar droppings.
   5. Remove snow and ice; do not install stonework until substrate surfaces are dry.

B. Cold Weather Requirements. When either the ambient air temperature or the temperature of masonry units is below 40ºF:
   1. Submit proposed procedures to the Architect.
   2. Materials:
      a. Ensure that temperature of masonry units is greater than 20ºF when laid in the masonry.
      b. Remove visible ice from masonry units before laying in the masonry.
      c. Heat mortar sand or mixing water to produce mortar temperatures between 40ºF and 120ºF at the time of mixing. Maintain mortar above freezing until used in masonry.
   3. Protection when laying masonry:
      a. Use heat sources when ambient temperature is between 20ºF and 25ºF on both sides of the masonry under construction.
      b. Provide wind breaks when wind velocity is in excess of 15 mph.
      c. When ambient temperature is below 20ºF, provide temporary enclosure for the masonry under construction and provide temporary heat to maintain temperature above 32ºF within the enclosure.
   4. Protection after laying masonry:
      a. When mean daily temperature (average of high and low) is between 32ºF and 40ºF, protect completed masonry from rain or snow by covering with a weather-resistant membrane for 24 hours after construction.
      b. When mean daily temperature (average of high and low) is between 25ºF and 32ºF, completely cover completed masonry with a weather-resistant membrane for 24 hours after construction.
      c. When mean daily temperature (average of high and low) is between 20ºF and 25ºF, completely cover completed masonry with insulating blankets for 24 hours after construction.
      d. When mean daily temperature (average of high and low) is below 20ºF, maintain the temperature of masonry above 32ºF for 24 hours after construction by providing temporary enclosure with temporary heat, by providing electric heating blankets or infrared heat lamps, or by other approved methods.

C. Hot weather construction.
   1. Submit proposed procedures to the Architect.
   2. Preparation. The following requirements shall be met prior to conducting masonry work.
      a. Temperature. When the ambient temperature exceeds 100ºF (38ºC), or exceeds 90ºF (32ºC) with a wind velocity greater than 8 mph (13 km/h):
         1) Necessary conditions and equipment shall be provided to produce mortar having a temperature below 120ºF (49ºC).
         2) Sand piles shall be maintained in a damp, loose condition.

b. Special conditions. When the ambient temperature exceeds 115ºF (46ºC), or 105ºF (40ºC) with a wind velocity greater than 8 mph (13 km/h), observe the above requirements and in addition, provide shade so that direct sunlight does not fall on materials and mixing equipment.

3. Construction. The following requirements shall be met while masonry work is in progress.
   a. Temperature. When the ambient temperature exceeds 100ºF (38ºC), or exceeds 90ºF (32ºC) with a wind velocity greater than 8 mph (13 km/h):
      1) The temperature of mortar and grout shall be maintained below 120ºF (49ºC).
      2) Mixers, mortar transport containers and mortar boards shall be flushed with cool water before they come into contact with mortar ingredients or mortar.
      3) Mortar consistency shall be maintained by retempering with cool water. Do not retemper colored mortar.
      4) Mortar shall be used within 2 hours of initial mixing.
   b. Special conditions. When the ambient temperature exceeds 115ºF (46ºC), or exceeds 105ºF (40ºC) with a wind velocity greater than 8 mph (13 km/h), observe the above requirements and in addition cool mixing water used for mortar and grout. The use of ice shall be permitted in the mixing water prior to use. Ice shall not be permitted in the mixing water when added to the other mortar or grout materials.
4. Protection. When the mean daily temperature exceeds 100ºF (38ºC), or exceeds 90ºF (32ºC) with a wind velocity greater than 8 mph (13 km/h), newly constructed masonry shall be fog sprayed until damp at least three times a day until the masonry is three days old.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle materials in a manner to prevent damage and deterioration.
   1. Use only non-staining materials in contact with stone.

B. Sand:
   1. Maintain sand at a constant moisture content.
   2. Cover pile when not in use.
   3. Arrange pile for free drainage.
   4. Do not use the bottom portion of the pile (wet or in contact with earth) in mortar.
   5. At Contractor's option use bagged, kiln-dried sand.

C. Cement and Lime:
   1. Store materials raised above ground on pallets or similar flooring to prevent moisture pick-up.
   2. Store materials under cover to prevent moisture pick-up from rain or snow.
   3. Do not tarp or wrap materials so as to trap moisture or to permit condensation to form.
   4. Allow air to circulate freely around units.
   5. Do not use bags that have been broken or exposed to moisture.

PART 2 PRODUCTS

2.01 SUBSTITUTIONS

A. Refer to Section 01600 - Product Requirements.

2.02 STONE

A. General: Provide stone free of defects which would impair strength, durability, or appearance.
   1. Provide stone of uniform coloration, within the range specified or approved.
   2. Obtain stone from one quarry.

3. Exposed face of stones shall have no drill marks, grooves or other evidence of drilled quarry operation.

2.03 MORTAR MATERIALS

A. Deliver cementitious materials to the job site in bags containing factory proportioned quantities of cement and lime in each bag according to the approved design mix, unless an alternate method of batching is approved by the Architect. Manufacturer's label on each bag shall clearly indicate compliance with this specification. Labels bearing the words “masonry cement” shall in addition bear the words “portland-lime” or other clear indication of compliance with this specification.

B. Portland Cement: ASTM C 150, Type I.
   1. Masonry Cement and Mortar Cement are not acceptable.

C. Hydrated Lime: ASTM C 207, Type S.

D. Mortar Aggregate: ASTM C 144.
   1. Aggregate for Pointing Mortar: 100% passing #16 sieve.

E. Grout Aggregate: ASTM C 404.

F. Water: Clean and potable.

G. Do not use antifreeze compounds, accelerators, water repellents, air-entraining admixtures, other admixtures, or products containing such materials.

2.04 ACCESSORY MATERIALS

A. Stone Anchors:

B. Drainage Mat:
   1. CavClear Stone Mat.
      a. Thickness: 1 inch.
      b. Width: 16 inches.

C. Weeps:
   1. CavClear Stone Mat. 3/8 inch thickness cut into 2-inch-wide strips, 16 inches long.
      a. Color: Standard color most closely matching mortar color.

2.05 FLASHINGS

A. Receivers and Counterflashing: Specified in Section 07620.

B. Flashing Materials: Self-adhesive sheet membrane, as specified in Section 07650.

2.06 FABRICATION - STONE

A. Fabricate stonework as indicated and as required to comply with other requirements.
   1. Saw or roughly dress backs to approximate true plane.
   2. Back-check (cut out) backs of stones as required to clear structural members.

2.07 MIXING

A. Mix proportions: 1 part Portland cement, 1 part lime, and 2-1/4 to 3 parts sand measured per the sum of the separate volumes of the cementitious constituents (ASTM C 270 proportion specification). No other ingredients allowed. Using aggregate void ratio as a guide, proportion sand so that voids between particles are filled with cement and lime, and a workable mix is obtained.

B. Mixing Setting Mortar:
   1. Use a paddle type mechanical batch mixer.

2. Use a positive means of measuring volumes of ingredients. Each batch shall contain a known volume of each ingredient. Measuring by shovels is not acceptable.
3. Mix batches using whole sacks of cementitious materials unless another method of equivalent accuracy is approved by the Architect.
4. Do not mix partial batches. Discard unused mix.
5. Use mortar as soon as possible.
6. Mortar that loses water by evaporation shall be retempered by the addition of water to restore its original consistency, providing the mortar has not begun to set.
7. Do not re-temper colored mortar.
8. Discard mortar that has begun to set.
9. Discard mortar that has not been used after 2-1/2 hours after original mixing.

C. Mixing order when lime and cement are bagged together (confirm with manufacturer and notify Architect if manufacturer's instructions differ):
1. Water: 75% of total.
2. Sand: Half.
3. Lime and cement: All.
4. Sand: Balance.
5. Water: To a workable consistency.
6. Mix: Not less than 3-1/2 nor more than 5 minutes after the introduction of cementitious material.

D. Mixing Pointing Mortar:
1. As above, except mix using only enough water to form a damp, unworkable mortar that retains its shape when formed into a ball.
2. Let mortar dwell 15 to 30 minutes in this conditions before using.
3. Add small amounts of water to adjust consistency.
4. Use within 1 hour of mixing.
5. Do not retemper or use mortar that has reached initial set.

E. Grout: ASTM C 476.
1. Slump, ASTM C 143: Adjust slump to provide for well consolidated grout without intruding into the drainage mat.
2. Fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

F. Mixing Grout: Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C 476 for fine and coarse grout.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions:
1. Verify that items to be built-in such as pipes, conduit, boxes, and other items are properly positioned and do not interfere with masonry or reinforcing.
2. Verify that non-masonry structural elements such as foundations for masonry, columns, beams, floor slab edges are properly positioned and do not interfere with masonry or required cavity.
3. Verity that field measurements of project conditions allow for proper coursing both vertically and horizontally, unless otherwise required by the contract documents. Notify the Architect of non-coursing conditions.

B. Ensure that as-built field tolerances of other trades will permit the proper construction of masonry.

C. Bearing and Cavity Width:
   1. Do not allow cavity widths to exceed 4-1/4 inches nor to be less than 1-1/2 inches.

D. Ensure that materials to be covered by masonry (such as studs, sheathing, insulation, membrane flashings, damproofing, etc.) are complete and have been inspected and approved before covering with masonry.

E. As masonry construction progresses and before covering flashings with masonry, verify that flashings are properly located, sealed watertight, and constructed so as to direct water to the outside.

F. Where conditions are not compliant, notify the Architect before beginning masonry construction.

G. Provide corrected conditions before beginning masonry construction.

3.02 DRAINAGE MAT

A. Install drainage mat in a continuous fashion from weeps to top of masonry. Ensure continuity of the drainage plane so as to direct water out of the wall and towards the exterior.

B. Secure the mat to to prevent displacement during grout placement..

3.03 SETTING STONE - GENERAL

A. Use skilled stone-fitters to perform field cutting at control joints and when required.
   1. Coordinate stonework installation with other work. Close up temporary openings, after other work is complete, with work matching work already installed.
   2. Install supports, stone anchors, and other fasteners.
   3. Set stone in patterns indicated, with uniform joints of dimensions indicated, and within tolerances specified.

B. Adjust anchors and supports as required.
   1. Attach stone anchors securely to stone and to backup surfaces.

C. Install flashing at lintels, angles, and ledges, and at other horizontal obstructions.

D. Install weeps at each flashing location and at each other location where moisture may collect. Locate weeps at not more than 2 feet on center.
   1. Before placing mortar on the bed joint, place 2 x 16 inch weeps flat on the bed joint, extending beyond the outside face of stone 1 to 2 inches. Extend the remaining 14 inches across the bed joint and up the face of the back-up. After pointing and joint finishing operation is complete, trim excess weep material flush with face of joint.

E. Collar Joint: Fill collar joint full with grout.
   1. Do not displace drainage mat. Ensure that drainage plane affords continuous drainage to weeps.

3.04 VENEER ANCHORS

A. Space anchors as follows:
   1. Two-Piece Anchors: Not more than 2.67 sf of wall area per anchor.
   2. One-Piece Anchors: Not more than 3.5 sf of wall area per anchor.
   3. Not more than 18 inches vertically.
   4. Not more than 32 inches horizontally.
   5. Openings larger than 16 inches: Install additional anchors within 12 inches of opening, spaced at not more than 36 inches on center.

6. Locate the first row of anchors not more than 16 inches above bearing elevation.
7. Locate the last row of anchors not more than 8 inches below the top of masonry panel (top of parapet, top of wall, underside of structure, below shelf angle, etc.).
8. Where veneer corners are not masonry bonded (an expansion joint occurs at the corner), locate the first column of anchors within 12 inches of outside face of masonry in both directions.
9. Where veneer corners are masonry bonded (no expansion joint at the corner), locate the first column of anchors within 16 inches of the outside face of masonry in both directions.

3.05 MORTAR JOINTS

A. Wet stones thoroughly at time of setting.

B. Lay stones with fully mortared bed and head (vertical) joints, unless otherwise indicated.

3.06 POINTING

A. Remove mortar from face of joint to at least 1/2 inch depth. Remove all unsound mortar.

B. Where mortar has been removed to different depths, apply layers of pointing mortar a maximum of 1/2 inch to 5/8 inch thick to form a joint of uniform depth.

C. Point joints with layers of pointing mortar.
1. Compact each layer fully and allow to become hard to the touch before placing next layer.

D. Tool joints promptly when mortar becomes hard to the touch.

3.07 SEALANTS

A. Set the following joints for sealant:
1. Joints between stone veneer and adjacent construction.
2. Sky facing joints in sills and caps.
3. Other joint as indicated on the drawings.

3.08 TOLERANCES

A. Conform to both code and visual tolerances.

B. Code Tolerances: As specified in ACI 530.1 paragraph 3.3G.

C. Visual: Variations in dimension, joint thickness, plumb, plane, line, alignment, offset, location in plan or elevation, etc., that are visible to the Architect under the “conditions for approval of appearance of completed appearance”, below shall be considered defective and shall, if ordered by the Architect, be corrected even though such conditions may fall within the tolerances specified in ACI 530.1.

D. Appearance of Completed Masonry:
1. The Architect will view the completed masonry to approve or reject the color consistency of the mortar, cleanliness of the masonry, and other aesthetic aspects of the work.
2. If the Contractor so requests, an initial determination will be made at not earlier than 2 weeks of age.
3. The Architect is the sole judge of aesthetic effect.
4. Initial approval will be given as a part of periodic site visits.
5. Final approval will be given only after scaffolding is removed and not earlier than 4 weeks after masonry has been laid.
6. Criteria for acceptance: Masonry shall be free of objectionable variations in color of the mortar, cleanliness of the new masonry, or other defective aesthetic effects. Lippage, or cocked or tilted brick are not acceptable.

7. Conditions for approval of completed appearance: Work will be viewed under normal daylight from a distance of 20 feet, except in those areas where work occurs adjacent to entrances and walking surfaces, which will be viewed at close hand.
8. Approval of technical considerations is not limited by viewing distance.

3.09 ADJUST AND CLEAN

A. Remove and replace stonework that:
   1. Is damaged (broken, chipped, stained, etc.).
   2. Does not match approved samples.
   3. Does not match approved mock-up.
   4. Has defective joints.
   5. Does not comply with requirements indicated.

B. Replace without evidence of patching or repair.

C. Clean stonework as soon as possible.
   1. Clean faces of stone at pointed joints immediately.
   2. Use clean water and stiff fiber brushes.
   3. Do not use cleaning tools or materials which could damage stone.
   4. Do not use acid unless approved by stone supplier.

3.10 PROTECTION

A. Protect completed work, and maintain protection until final completion.

END OF SECTION

SECTION 04 7200
CAST STONE MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Architectural cast stone.

B. Architectural cast stone, mortar set in masonry assemblies.

C. Units required are indicated on the drawings as "cast stone".

D. Units required are:
   1. Exterior wall units, including lintels.
   2. Other items indicated on the drawings.

E. Water repellent.

F. Cleaner.

1.02 REFERENCES

A. ACI 318 - Building Code Requirements for Structural Concrete; 2008.

B. ASTM A 185 - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete; 2007.

C. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 2007.

D. ASTM A 775/A 775M - Standard Specification for Epoxy-coated Reinforcing Steel Bars; 2007b.

E. ASTM C 1364 - Standard Specification for Architectural Cast Stone; 2007.

1.03 SUBMITTALS

A. Manufacturer's Qualifications.

B. Product Data:
   1. Water repellent: Manufacturer's technical product data and recommendations for use.

C. Shop Drawings: Include elevations, dimensions, layouts, profiles, cross sections, reinforcement, exposed faces, arrangement of joints, anchoring methods, anchors, and piece numbers.
   1. Sealed by a professional structural engineer.

D. Manufacturer's Instructions for Water Repellent: Detailed application instructions, including weather limitations, condition of substrates, surface preparation or cleaning, protection of adjacent surfaces, application of product, and cleaning of accidental over-spray and spills.

E. Samples:
   1. Verification Samples: Pieces of actual cast stone components not less than 12 inches square, illustrating range of color and texture to be anticipated in components furnished for the project.
   2. Water Repellent: Submit 16 inch (406 mm) square sample of cast stone to receive water repellent. Leave 1/3 of panel untreated, apply 1 coat of water repellent to 1/3 of panel, and apply 2 coats to remaining 1/3 of panel.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: A current producer member of the Cast Stone Institute or the Architectural Precast Association with a minimum of five years of experience in producing cast stone of the types required for project.

B. Mock-Up:
   1. Provide and install cast stone in mock-up.
   2. Do not begin production of units without the Architect's approval of the mock-up.
   3. Mock-up may remain as part of the completed work.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver cast stone components secured to shipping pallets and protected from damage and discoloration. Protect corners from damage.

B. Number each piece individually to match shop drawings and schedule.

C. Store cast stone components and installation materials in accordance with manufacturer's instructions.

D. Store cast stone components on pallets with nonstaining, waterproof covers. Ventilate under covers to prevent condensation. Prevent contact with dirt.

E. Protect cast stone components during handling and installation to prevent chipping, cracking, or other damage.

F. Store mortar materials where contamination can be avoided.

G. Schedule and coordinate production and delivery of cast stone components with unit masonry work to optimize on-site inventory and to avoid delaying the work.

H. Water Repellent:
   1. Deliver materials to the project site in manufacturer's unopened original containers.
   2. Store materials in dry, well-ventilated space.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide units produced by one of the following
   1. Architectural Concrete Co., Inc. / Tannerstone; Palmetto, GA (770-463-1932).
   2. Architectural Ornamental Castings; Decatur, GA (404-378-6458).
   3. ConArt, Inc.; Cobb, GA (912-835-5000).
   4. Continental Cast Stone South; Savannah, GA (912-447-0207).
   5. Engineered Stone Products (229-273-5200).
   6. Miller Precast, Inc.; Columbus, GA (706-689-7982).

2.02 DESIGN REQUIREMENTS

A. Concrete Substrates: Design connections using inserts cast into cast-in-place concrete and into cast stone units, with field-bolted anchors.

B. Masonry Substrates: Design connections using dowels, anchors, and ties embedded into masonry and into cast stone units.

C. Structural Steel Frame: Design connections using supplemental steel to hang cast stone units.

D. Design connections to provide field adjustment of position in three dimensions.

E. Connections shall neither penetrate nor conflict with flashings and other elements of the building’s weather envelope, unless the Contractor submits specific written request illustrating the proposed method of establishing the integrity of flashing and other elements of the building's weather envelope, and such request is approved by the Architect in writing.

F. Design connections to direct water which may intrude into cavity toward the exterior, not the interior, of the building.

G. Structural requirements: Size and locate reinforcing to accommodate indicated loads as required by applicable code, and as required by handling and transport.

H. Provide a cross-sectional area of reinforcing equal to or exceeding 0.25% of the cross-section of the unit. Units of 12 or more inches in any sectional dimension shall have temperature steel oriented in both directions.

I. Reinforcement: Provide reinforcement as required to withstand handling and dead and live loads in compliance with ACI 318 and ASTM C 1364.

2.03 ARCHITECTURAL CAST STONE

A. Cast Stone: Architectural concrete product manufactured to simulate appearance of natural limestone, complying with ASTM C 1364.

B. Color and Texture:
1. Match sample on file at Architect's office.
2. Limestone

C. Remove cement film from exposed surfaces before packaging for shipment.

D. Shapes: Provide shapes indicated on drawings.
1. Variation from Any Dimension, Including Bow, Camber, and Twist: Maximum of plus/minus 1/8 inch or length divided by 360, whichever is greater, but not more than 1/4 inch.
2. Unless otherwise indicated on drawings, provide:
a. Wash or slope of 1:12 on exterior horizontal surfaces.
b. Drips on projecting components, wherever possible.
c. Raised fillets at back of sills and at ends to be built in.

2.04 MATERIALS

A. Reinforcing:
1. Reinforcing Bars: ASTM A 615/A 615M, deformed bars, galvanized.
2. Reinforcing Mesh: ASTM A 185, galvanized.
3. Steel Welded Wire Reinforcement: ASTM A 185, galvanized.
4. Provide 1-1/2 inches (38 mm) of cover unless otherwise required or permitted.
5. Where less than 1-1/2 inches (38 mm) of cover is required and approved, provide epoxy coated reinforcing bars complying with ASTM A 775, along with epoxy or plastic coated tie wire and accessories, or Type 304 stainless steel deformed reinforcing bars, tie wire, and accessories.

B. Mortar: Specified In Section 04810.

C. Sealant: As specified in Section 07 9000.

D. Water Repellent:
1. Products: Provide one of the following:
a. Chemprobe Coating Systems; Product Dur A Pell 40 S: www.chemprobe.com.
b. Chemrex, Inc., Hydrozo Div.; Product Enviroseal 40: www.chemrex.com.

E. Cleaner: General-purpose cleaner designed for removing mortar and grout stains, efflorescence, and other construction stains from new masonry surfaces without discoloring or damaging masonry surfaces; approved for intended use by cast stone manufacturer and by cleaner manufacturer for use on cast stone and adjacent masonry materials.

2.05 WATER REPELLENT APPLICATION

A. Preparation:
   1. Clean substrate, removing substances deleterious to penetration or performance of water repellents.
   2. Moisture Content: Test cleaned substrates according to manufacturer's instructions before applying water repellents.

B. Application: Apply to units before installing units on the building. Comply with manufacturer's written application instructions.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install cast stone components in conjunction with masonry, complying with requirements of Section 04 2000.

B. Mortar Set:
   1. Set cast stone components with mortar as specified in Section 04 2000 .
   2. Drench cast stone components with clear, running water immediately before installation.
   3. Set units in a full bed of mortar unless otherwise detailed.
   4. Ensure that head joints are full of mortar and without voids, except where sealant joints are indicated.
   5. Fill dowel holes and anchors slots with mortar.

C. Joints: Make all joints 3/8 inch, except as otherwise detailed.
   1. Rake mortar joints 3/4 inch for pointing. Scrub face of each stone to remove excess mortar before it sets.
   2. Point joints with mortar in layers 3/8 inch thick and tool to a slight concave profile.

D. Leave the following joints open for sealant:
   1. Head joints in top courses, including copings, parapets, cornices, sills, and steps.
   2. Head joints in wash surfaces of sills, water tables, and similar projecting courses.
   3. Joints between rigidly anchored units.
   4. Joints below lugged sills and stair treads.
   5. Joints below ledge and relieving angles.
   6. Joints labeled "expansion joint" or "control joint".

E. Installation Tolerances:
   1. Variation from Plumb: Not more than 1/8 inch in 10 feet or 1/4 inch in 20 feet or more.
   2. Variation from Level: Not more than 1/8 inch in 10 feet or 1/4 inch in 20 feet, or 3/8 inch maximum.
   3. Variation in Joint Width: Not more than 1/8 inch in 36 inches or 1/4 of nominal joint width, whichever is less.

3.02 CLEANING AND PROTECTION

A. Do not install units that are damaged or fail to conform to project requirements. Remove any such units inadvertently installed, or that are damaged after installation, and replace with new.

B. If approved by Architect, limited patching of a limited number of units may be employed in lieu of replacement. Excessive damage, either in severity or in quantity, may be considered defective work by the Architect.
   1. Using mock-up cast stone units that have not been incorporated in the work, demonstrate patching techniques and results to be expected, and obtain the approval of the Architect prior to patching units already installed.

2. Repairs shall not be discernible to the ordinary observer, as determined by the Architect, when viewed from a distance of 12 to 20 feet (3.6 to 6.1 m), except that repair to units used within 20 feet (6.1 m) of entranceways and similar locations subject to close contact shall not be discernible from a distance of 3 feet (.9 m).
3. Spalls: Chip out spalled area to a depth of at least 1/2 inch (13 mm) using stone mason's chisel. Create a reasonable smooth, squared edge profile. Over a fully wetted (saturated, surface-dry) substrate, scrub a thick cream consistency slurry of portland cement, fine aggregate, and water and immediately apply patching material composed of the same aggregates, cements, and pigments used in the cast stone units, adjusted as necessary for use as a patching material. Do not use polymer bonding agents or admixtures. Where original materials employed in plant fabrication are not suitable as patching materials, replace or repair units as directed by the Architect.
4. Cracks: Inject cracks as directed by the Architect.

C. Repair chips and other surface damage noticeable when viewed in direct daylight at 20 feet.
1. Repair with matching touchup material provided by the manufacturer and in accordance with manufacturer's instructions.
2. Repair methods and results subject to Architect 's approval.

D. Clean cast stone components as work progresses; remove mortar fins and smears before tooling joints.

E. Clean cast stone as specified in Section 04 2000 - Unit Masonry Assemblies.

F. Protect from splashing by mortar and other damage.

END OF SECTION

SECTION 05 1200
STRUCTURAL STEEL

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 following:

1. Structural steel.
2. Architecturally exposed structural steel.
3. Grout.

B. Related Sections include the following:

1. Division 1 Section "Quality Control Service" for independent testing agency procedures and administrative requirements.
2. Division 5 Section "Steel Decking" for field installation of shear connectors.
3. Division 5 Section "Miscellaneous Metal" for miscellaneous steel fabrications and other metal items not defined as structural steel.
4. Division 9 painting Sections for surface preparation and priming requirements.

1.3 DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by AISC's "Code of Standard Practice for Steel Buildings and Bridges," that support design loads.

B. Architecturally Exposed Structural Steel: Structural steel designated as architecturally exposed structural steel (AESS) in the Contract Documents.

1.4 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand ASD-service loads indicated and comply with other information and restrictions indicated.

1. Select and complete connections using schematic details indicated and AISC's "Manual of Steel Construction, Allowable Stress Design," Part 4.
2. Engineering Responsibility: Fabricator's responsibilities include using a qualified professional engineer to prepare structural analysis data for structural-steel connections.

B. Construction: Type 2, simple framing.

1.5 SUBMITTALS

A. Product Data (for Architects record): For each type of product indicated.

B. Shop Drawings (for Architects review): Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.

C. Welding certificates (for Architects record).

D. Qualification Data(for Architects record) : For Installer and Fabricator.

E. Mill Test Reports (for Architects record): Signed by manufacturers certifying that the following products comply with requirements:

1. Structural steel including chemical and physical properties.
2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
3. Direct-tension indicators.
4. Tension-control, high-strength bolt-nut-washer assemblies.
5. Shear stud connectors.
6. Shop primers.
7. Nonshrink grout.

F. Source quality-control test reports (for Architects record).

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator who participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category Cbd.

B. Installer Qualifications: A company specializing in performing the work of this Section with a minimum of 10 years documented experience.

C. Steel Detailing: Connections not detailed on the Drawings shall be designed by the fabricator under the direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the Project state. Steel detailer shall be a certified senior detailer as certified by the National Institute of Steel Detailing.

D. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."

E. Comply with applicable provisions of the following specifications and documents:

1. AISC's "Code of Standard Practice for Steel Buildings and Bridges."
2. AISC's "Seismic Provisions for Structural Steel Buildings" and "Supplement No. 2."
3. AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design or Load and Resistance Factor Design Specification for Structural Steel Buildings."
4. AISC's "Specification for the Design of Steel Hollow Structural Sections."
5. AISC's "Specification for Allowable Stress Design of Single-Angle Members or Specification for Load and Resistance Factor Design of Single-Angle Members."
6. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

F. Pre-construction: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from erosion and deterioration.

1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.
2. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.8 COORDINATION

A. Furnish anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A 992/A 992M unless noted otherwise.

B. Channels, Angles, M , S-Shapes: ASTM A 36/A 36M unless noted otherwise.

C. Plate and Bar: ASTM A 36/A 36M unless noted otherwise.

D. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B structural tubing.

E. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.

F. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.

1. Finish: Plain unless noted otherwise.
2. Direct-Tension Indicators: ASTM F 959, Type 325 compressible-washer type.

a. Finish: Plain unless noted otherwise.

B. High-Strength Bolts, Nuts, and Washers: ASTM A 490, Type 1, heavy hex steel structural bolts or tension-control, bolt-nut-washer assemblies with splined ends; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers, plain.

1. Direct-Tension Indicators: ASTM F 959, Type 490 compressible-washer type, plain.

C. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy hex head steel structural bolts with splined ends; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.

1. Finish: Plain unless noted otherwise.

D. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1, Type B.

E. Unheaded Anchor Rods: ASTM F 1554, Grade 55, weldable.

1. Configuration: Straight.
2. Nuts: ASTM A 563 heavy hex carbon steel.
3. Plate Washers: ASTM A 36/A 36M carbon steel.
4. Washers: ASTM F 436 hardened carbon steel.
5. Finish: Plain unless noted otherwise.

F. Threaded Rods: ASTM A 36/A 36M

1. Nuts: ASTM A 563 heavy hex carbon steel.
2. Washers: ASTM F 436 hardened carbon steel.
3. Finish: Plain unless noted otherwise.

G. Clevises and Turnbuckles: ASTM A 108, Grade 1035, cold-finished carbon steel.

H. Eye Bolts and Nuts: ASTM A 108, Grade 1030, cold-finished carbon steel.

I. Sleeve Nuts: ASTM A 108, Grade 1018, cold-finished carbon steel.

2.3 PRIMER

A. Primer for Steel not receiving finish coat: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer. Steel surfaces to be galvanized, welded or encased in concrete or fireproofing, connections designated as Slip Critical type, or surfaces receiving welded shear connectors in the field shall not be painted.

B. Primer for Steel receiving finish coat. Primer shall be compatible with finish coat.

C. Galvanizing Repair Paint: ASTM A 780.

2.4 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC's Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design.

1. Camber structural-steel members where indicated. Camber values less than those indicated on the drawings shall be submitted to the Architect for review. Camber values greater than those indicated on the drawings are not acceptable.
2. Identify high-strength structural steel according to ASTM A 6/ A 6M and maintain markings until structural steel has been erected.
3. Mark and match-mark materials for field assembly.
4. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Architecturally Exposed Structural Steel: Comply with fabrication requirements, including tolerance limits, of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel identified as architecturally exposed structural steel.

1. Fabricate with exposed surfaces smooth, square, and free of surface blemishes including pitting, rust, scale, seam marks, roller marks, rolled trade names, and roughness.
2. Remove blemishes by filling or grinding or by welding and grinding, before cleaning, treating, and shop priming.

C. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.

D. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.

E. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

F. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according SSPC-SP 2, Hand Tool Cleaning.

G. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.

H. Holes: Provide holes required for securing other work to structural steel and for passage of other work through steel framing members.

1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
2. Base-Plate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.6 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: See Drawings.

B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.

1. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.
3. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld show-through on exposed steel surfaces.

a. Grind butt welds flush.
b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

2.7 SHOP PRIMING

A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Surfaces to be high-strength bolted with slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials.
5. Galvanized surfaces.
6. Surfaces to receive field applied welded shear connectors.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
   1. SSPC-SP 2, "Hand Tool Cleaning." For steel not receiving finish coat.
   2. SSPC-SP6/NACE No.3, "Commercial Blast Cleaning" For steel receiving finish coat.

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 3 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

   1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
   2. Apply two coats of shop paint to inaccessible surfaces after assembly or erection. Change color of second coat to distinguish it from first.

2.8 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/ A 123M.

   1. Fill vent holes and grind smooth after galvanizing.
   2. Galvanize lintels and shelf angles attached to structural-steel frame and located in exterior walls.

2.9 SOURCE QUALITY CONTROL

A. Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.

   1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welded Connections: In addition to visual inspection of all welds, all full penetration and butt welded connections will be tested and inspected according to AWS D1.1 with one of the following inspection procedures, at testing agency's option:

   1. Liquid Penetrant Inspection: ASTM E 165.
   2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
   3. Ultrasonic Inspection: ASTM E 164.
   4. Radiographic Inspection: ASTM E 94.

E. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1 for stud welding and as follows:

1. Bend tests will be performed if visual inspections reveal either a less-than- continuous 360-degree flash or welding repairs to any shear connector.
2. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, for compliance with requirements.

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

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design.

B. Base and Bearing Plates: Remove bond-reducing materials from concrete-bearing and masonry-bearing surfaces. Clean bottom surface of base and bearing plates.

1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of base plate.
3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate before packing with grout.
4. Promptly pack grout solidly between bearing surfaces and base or bearing plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Maintain erection tolerances of structural steel and architecturally exposed structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.

E. Splice members only where indicated.

F. Remove erection bolts on welded, architecturally exposed structural steel; fill holes with plug welds; and grind smooth at exposed surfaces.

G. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1.

H. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: See Drawings.

B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.

1. Comply with AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.
4. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld show-through on exposed steel surfaces.

a. Grind butt welds flush.
b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.

B. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: Field welds will be visually inspected according to AWS D1.1.

1. In addition to visual inspection of all field welds, all full penetration and butt welds will be tested according to AWS D1.1 with one of the following inspection procedures, at testing agency's option:

a. Liquid Penetrant Inspection: ASTM E 165.
b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
c. Ultrasonic Inspection: ASTM E 164.
d. Radiographic Inspection: ASTM E 94.

D. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.6 REPAIRS AND PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists and accessories, bearing plates, and abutting structural steel.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

END OF SECTION

SECTION 05 3100
STEEL DECKING

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 following:

1. Roof Deck Roof deck.

B. Related Sections include the following:
1. Division 5 Section "Structural Steel" for shop-welded shear connectors.
2. Division 5 Section "Miscellaneous Metal" for framing deck openings with miscellaneous steel shapes.

1.3 SUBMITTALS

A. Product Data (For Architects Record): For each type of deck, accessory, and product indicated.

B. Shop Drawings (For Architects Review): Show layout and types of deck panels, anchorage details, reinforcing channels, pans, deck openings, special jointing, accessories, and attachments to other construction.

C. Product Certificates (For Architects Record): Signed by steel deck manufacturers certifying that products furnished comply with requirements.

D. Welding Certificates (For Architects Record): Copies of certificates for welding procedures and personnel.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed steel deck similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

C. Fire-Test-Response Characteristics: Provide steel deck units identical to those steel deck units tested for fire resistance per ASTM E 119 by a testing and inspection agency acceptable to authorities having jurisdiction.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.

D. AISI Specifications: Calculate structural characteristics of steel deck according to AISI's "Specification for the Design of Cold-Formed Steel Structural Members."

E. FM Listing: Provide steel roof deck evaluated by FM and listed in FM's "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Steel Deck:
   a. Consolidated Systems, Inc.
   b. Epic Metals Corp.
   c. Nucor Corp.; Vulcraft Div.
   d. United Steel Deck, Inc.
   e. Verco Manufacturing Co.
   f. Wheeling Corrugating Co.; Div. of Wheeling-Pittsburgh Steel Corp.

2.2 ROOF DECK

A. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 30, and the following:

1. Prime-Painted Steel Sheet: ASTM A 611, Grade C minimum, shop primed with gray or white baked-on, lead- and chromate-free rust-inhibitive primer complying with performance requirements of FS TT-P-664.

2. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33), G60 zinc coating.
3. Deck Profile: See Drawings.
4. Profile Depth: See Drawings.
5. Design Uncoated-Steel Thickness: See Drawings
6. Side Laps: See Drawings

2.3 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter unless noted otherwise on structural drawings.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Steel Sheet Accessories: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.

G. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi , of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 30 for overhang and slab depth unless noted otherwise.

H. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.

I. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0598 inch thick, with factory-punched hole of 3/8-inch minimum diameter.

J. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck, with 3-inch wide flanges and level recessed pans of 1-1/2- inch minimum depth. For drains, cut holes in the field.

K. Shear Connectors: ASTM A 108, Grades 1010 through 1020 headed stud type, cold-finished carbon steel, AWS D1.1, Type B, with arc shields.

L. Galvanizing Repair Paint: ASTM A 780.

M. Repair Paint: Lead- and chromate-free rust-inhibitive primer complying with performance requirements of FS TT-P-664.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 30, manufacturer's written instructions, and requirements in this Section.

B. Install temporary shoring before placing deck panels, if required to meet deflection or unshored clear span limitations.

C. Locate decking bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to decking.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of decking, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3 ROOF DECK INSTALLATION

A. Fasten roof deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter, but not less than 1-1/2 inches long, and as follows:

1. Weld Diameter: As indicated on the drawings..
2. Weld Spacing: As indicated on drawings.
3. Weld Washers: Install weld washers at each weld location for deck units with an unfinished metal thickness less than 0.028 inches.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps as follows:

1. Mechanically fasten with self-drilling No. 10 diameter carbon-steel screws.
2. Quantity as indicated on structural drawings.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 2 inches, with end joints as follows:

1. End Joints: Lapped 2 inches minimum

D. Roof Sump Pans and Sump Plates: Install over openings provided in roof decking and weld flanges to top of deck. Space welds not more than 12 inches apart with at least 1 weld at each corner.

E. Miscellaneous Roof Deck Accessories: Install ridge and valley plates, finish strips, cover plates, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.

F. Hanging Loads: Do not hang loads from roof deck.

3.4 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing agency to perform field quality control testing.

B. Testing Agency will inspect all field welds.

C. Shear connector stud welds will be inspected and tested according to AWS D1.1 for stud welding and as follows:

1. Shear connector stud welds will be visually inspected.
2. Bend tests will be performed if visual inspections reveal less than a full 360-degree flash or welding repairs to any shear connector stud.
3. Tests will be conducted on additional shear connector studs if weld fracture occurs on shear connector studs already tested according to AWS D1.1.

D. Testing agency will report test results promptly and in writing to Contractor and Architect.

E. Remove and replace work that does not comply with specified requirements.

F. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.5 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.

C. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 05 4000
COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.01 SUMMARY

A. Types of cold-formed metal framing units include the following:
   1. Non load-bearing exterior wall studs.
   2. Non load-bearing interior wall studs.
   3. Miscellaneous framing including but not limited to cornices, parapet returns, braces and kickers.

1.02 SUBMITTALS

A. Product data and installation instructions for each item of cold-formed metal framing and accessories.

B. Structural Calculations
   1. Submit complete calculations for design of all members and connections, including connections to the supporting structure. Calculations shall be prepared and sealed by an engineer currently registered in the state where the project is being constructed. Gauges shown on the drawings are minimum gauges.
   2. Design shall be in accordance with AISI “Specification for Design of Cold-Formed Steel Structural Members” and the International Building Code, 2000 Edition.
   3. Design Criteria
      a. Wind speed 90 MPH
      b. Dead load As required by materials indicated on the drawings.
      c. Deflection due to wind shall be less than or equal to span/600 at brick veneer conditions and SPAN/360 for all other conditions.

C. Shop drawings
   1. Include placing drawings for framing members showing size and gage designations, connection information, number, type, location, and spacing. Indicate supplemental strapping, bracing, splices, bridging, accessories, and details required for proper installation.

1.03 QUALITY ASSURANCE

A. Component Design: Calculate structural properties of studs and joists in accordance with American Iron and Steel Institute (AISI) "Specification for Design of Cold-Formed Steel Structural Members."

B. Welding: Use qualified welders and comply with American Welding Society (AWS) D1.3, "Structural Welding Code - Sheet Steel."

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products of one of the following:

1. Dale Industries, Inc.
2. Dietrich Industries, Inc.
3. Unimast Incorporated
4. or equal.

2.02 METAL FRAMING

A. System Components: Manufacturers' steel studs and joists of type, size, shape, and gage as required by manufacturer’s calculations and shop drawings. With each type of metal framing required, provide manufacturer's standard steel runners (tracks), blocking, lintels, clip angles, shoes, reinforcements, fasteners, and accessories for applications indicated, as needed to provide a complete metal framing system.

2.03 MATERIALS AND FINISHES:

A. For 16-gage and heavier units, fabricate metal framing components of structural quality steel sheet with a minimum yield point of 50,000 psi; ASTM A 446, A 570, or A 611.

B. For 18-gage and lighter units, fabricate metal framing components of commercial quality steel sheet with a minimum yield point of 33,000 psi; ASTM A 446, A 570, or A 611.

C. Provide galvanized finish to metal framing components complying with ASTM A 525 for minimum G 60 coating.

D. Fasteners: Provide nuts, bolts, washers, screws, and other fasteners with corrosion-resistant plated finish.

E. Electrodes for Welding: Comply with AWS Code and as recommended by stud manufacturer.

F. Galvanizing Repair: Where galvanized surfaces are damaged, prepare surfaces and repair in accordance with procedures specified in ASTM A 780.

2.04 FABRICATION

A. General: Framing components may be prefabricated into assemblies before erection. Fabricate panels plumb, square, true to line, and braced against racking with joints welded. Perform lifting of prefabricated units to prevent damage or distortion.

B. Fabricate units in jig templates to hold members in proper alignment and position and to assure consistent component placement.

C. Fastenings: Attach similar components by welding. Attach dissimilar components by welding, bolting, or screw fasteners, as standard with manufacturer.

D. Wire tying of framing components is not permitted.

E. Fabrication Tolerances: Fabricate units to a maximum allowable tolerance variation from plumb, level, and true to line of 1/8 inch in 10 feet.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: Install metal framing systems in accordance with manufacturer's printed or written instructions and recommendations and in accordance with approved shop drawings.

B. Runner Tracks: Install continuous tracks sized to match studs. Align tracks accurately to layout at base and tops of studs. Secure tracks as recommended by stud manufacturer and in accordance with approved shop drawings for type of construction involved, except do not exceed 24 inches o.c. spacing for nail or power-driven fasteners or 16 inches o.c. for other types of attachment. Provide fasteners at corners and ends of tracks.

C. Installation of Joists: Install level, straight, and plumb, complete with bracing and reinforcing as indicated on drawings. Provide not less than 1-1/2-inch end bearing.
1. Reinforce ends with end clips, steel hangers, steel angle clips, steel stud section, or as otherwise recommended by joist manufacturer.
2. Where required, reinforce joists at interior supports with single short length of joist section located directly over interior support, snap-on shoe, 30 percent side-piece lapped reinforcement, or other method recommended by joist manufacturer.
3. Secure joists to interior support systems to prevent lateral movement of bottom flange.

D. Field Painting: Touch-up damaged shop-applied protective coatings. Use compatible primer for prime-coated surfaces; use galvanizing repair system for galvanized surfaces.

END OF SECTION

SECTION 05 4400

PRE-ENGINEERED, PRE-FABRICATED COLD-FORMED METAL ROOF TRUSSES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes pre-engineered, pre-fabricated cold-formed steel framing elements. Work includes:
   1. Cold-Formed steel open web floor trusses.
   2.Cold-Formed steel roof trusses.
   3.Anchorage, bracing and bridging.

B. Related Sections
   1. Section 05 3000 – Metal Decking
   2. Section 05 4000 – Cold-Formed Steel Framing

1.2 REFERENCES

A. Reference standards:
   1. ASTM:
      a. ASTM A653/A653M-94 “Sheet Steel, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Glavanealed) by the Hot Dip Process.”
      b. ASTM A780-93a “Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.”
   2. American Welding Society (AWS)
      a. AWS D1.1 “Structural Welding Code - Steel.”
      b. AWS D1.3 “Structural Welding Code - Sheet Steel.”
   3. Light Gauge Steel Engineers Association Field Installation Guide
   4. American Iron and Steel Institute, North American Specification for the Design of Cold-Formed Steel Structural Members, 2001 American Iron and Steel Institute Standard for Cold-Formed Steel Framing – Truss Design, 2001

1.3 PERFORMANCE REQUIREMENTS

A. AISI “Specifications”: Calculate structural characteristics of cold-formed steel truss members according to American Iron and Steel Institute “North American Specification for the Design of Cold-Formed Steel Structural Members, 2001”
B. Structural Performance: Design, fabricate, and erect cold-formed steel trusses to withstand specified design loads within limits and under conditions required.
   1. Design Loads: As specified.
   2. Deflections: Live load deflection meeting the following (unless otherwise specified):
      a. Roof Trusses: Vertical deflection less than or equal to Length/240.
      b. Floor Trusses: Vertical deflection less than or equal to Length/480.
   3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change (range) of 120 deg F (67 deg C).

1.4 SUBMITTALS

A. Submit manufacturer's product data and installation instructions for each type of cold-formed steel framing and accessory required.

B. Submit detailed floor truss and roof truss layouts indicating placement of trusses.

C. Submit individual truss drawings, sealed and signed by a qualified registered Professional Engineer, verifying accordance with local building code and design requirements.
Include:
1. Description of design criteria.
2. Engineering analysis depicting member stresses and truss deflection.
3. Truss member sizes and thickness and connections at truss joints.
4. Truss support reactions.
5. Top chord, Bottom chord and Web bracing requirements.

D. Submit final roof and floor plan drawings sealed and signed by a qualified registered Professional Engineer depicting final installed truss assembly.
Include:
1. All truss to truss connections
2. All truss to structure (bearing) connections
3. Plan and details for the location of all permanent lateral and diagonal bracing and/or blocking required in the top chord, web, and bottom chord planes. (Diaphragms excluded)

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Fabrication shall be performed in a quality controlled manufacturing environment by a cold-formed steel truss fabricator with experience fabricating Cold-Formed Steel trusses equal in material, design, and scope to the trusses required for this Project.
1. Installation of Cold-Formed Steel truss roof or floor assembly shall be performed by an installer with experience installing Cold-Formed Steel trusses equal in material, design and scope to the trusses required for this Project.

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. Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure."

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's unopened containers or bundles, fully identified by name, brand, type and grade. Exercise care to avoid damage during unloading, storing and erection.

B. Store trusses on blocking, pallets, platforms or other supports off the ground and in an upright position sufficiently braced to avoid damage from excessive bending.

C. Protect trusses and accessories from corrosion, deformation, damage and deterioration when stored at job site. Keep trusses free of dirt and other foreign matter.

1.7 PROJECT CONDITIONS

A. During construction, adequately distribute all loads applied to trusses so as not to exceed the

carrying capacity of any one truss.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Ultra-Span® Truss Manufacturer. Contact Aegis Metal Framing, LLC at 1-888-902-3447, or www.aegismetalframing.com for a list of authorized fabricators.

Superior Steel Components-Locust
118 Pine Forest Drive
PO Box 297(mail to)
Locust, NC 28097
704-888-2848
FAX 704-888-2640
Website: http://www.lgst.com

Contacts

Mr. Tim Liescheidt : Tim.liescheidt@lgst.com

Mr. Kevin Peltz : Kevin.peltz@lgst.com

Service Area

·Alabama · Florida · Georgia · Mississippi · North Carolina · Northwest Territories · South Carolina · Texas · Virginia ·

Products

·Cold Formed Trusses · Cold Formed Wall Panels · Cold Formed Floor Joists ·

Builder's First Source/Bama Truss & Components, Inc.
P.O. Box 266
252 County Rd 308
Shelby, AL 35143
205-669-4188
FAX 205-669-4789
Website: http://www.bldr.com

Contacts

Mr. Jason Gardner : Jason.gardner@bldr.com

Mr. Michael Balliet : Michael.balliet@bldr.com

Service Area

·Alabama · Delaware · District of Columbia · Georgia · Louisiana · Maryland · Mississippi · New Jersey · New York · North Carolina · South Carolina · Tennessee · Virginia · West Virginia ·

Products

·Cold Formed Trusses · Cold Formed Floor Joists ·

Crown Structures, Inc.
5262 Longleaf Street
Jacksonville, FL 32209
904-924-8164
FAX 904-924-8167

Contacts

Mr. Ray Ho : crwnstrc@bellsouth.net

Mr. Ray Ho

Service Area

·Florida · Georgia · North Carolina · South Carolina ·

Products

·Cold Formed Trusses · Cold Formed Floor Joists ·

Stark Steel
351 International Circle
Summerville, SC 29483
800-868-4912
FAX 843-871-0603
Website: http://www.starktruss.com

Contacts

Doug Blackburn : Doug.Blackburn@starktruss.com

Service Area

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Products

·Cold Formed Trusses · Cold Formed Wall Panels · Cold Formed Floor Joists ·

Steelway International
210 Los Mochis
P.O. Box 1250
Canutillo, TX 79835
(915)877-2755
FAX 915-877-2764
Website: http://www.steelwayintl.com

Contacts

Kirk Hagler : KHagler@steelwayintl.com

Emmett Koen : Emmettt@steelwayintl.com

Service Area

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Kansas · Kentucky · Louisiana · Mississippi · Montana · Nevada · New Mexico · North

Carolina · Oklahoma · Oregon · South Carolina · Tennessee · Texas · Utah · Virginia · Washington · Wyoming ·

Products

·Cold Formed Trusses · Cold Formed Floor Joists ·

2.2 COMPONENTS

A. System components: Aegis Metal Framing, LLC ULTRA-SPAN® and POSI-STRUT® light gauge steel roof truss and floor truss components.

B. Provide manufacturer's standard steel truss members, bracing, bridging, blocking, reinforcements, fasteners and accessories with each type of steel framing required, as recommended by the manufacturer for the applications indicated and as needed to provide a complete cold-formed steel truss roof or floor assembly.

2.3 MATERIALS

A. Materials:
1. For all chord and web members: Fabricate components of structural quality steel sheet per ASTM A653 with a minimum yield strength of 50,000 psi.
2. Bracing, bridging and blocking members: Fabricate components of commercial quality steel sheet per ASTM A653 with a minimum yield strength of 33,000 psi.

B. Ultra-Span steel truss components: Provide sizes, shapes and gauges indicated.
1. Design Uncoated-Steel Thickness: 0.0350 inch (0.89 mm) (nominal 20 ga)
2. Design Uncoated-Steel Thickness: 0.0460 inch (1.17 mm) (nominal 18 ga)
3. Design Uncoated-Steel Thickness: 0.0570 inch (1.45 mm) (nominal 16 ga)
4. Design Uncoated-Steel Thickness: 0.0730 inch (1.85 mm) (nominal 14 ga)
5. Design Uncoated-Steel Thickness: 0.0970 inch (2.46 mm) (nominal 12 ga)

C. Finish: Provide components with protective zinc coating complying with ASTM A653, minimum G60 coating.

D. Fastenings:
1. Manufacturer recommended self-drilling screws with corrosion-resistant plated finish. Fasteners shall be of sufficient size and number to ensure the strength of the connection.
2. Welding: Comply with AWS D1.1 when applicable and AWS D1.3 for welding base metals less than 1/8" thick.
3. Other fasteners as accepted by truss engineer.

2.4 FABRICATION

A. Factory fabricate cold-formed steel trusses plumb, square, true to line, and with connections securely fastened, according to manufacturer's recommendations and the requirements of this Section.
1. Fabricate truss assemblies in jig templates.
2. Cut truss members by sawing or shearing or plasma cutting.
3. Fasten cold-formed steel truss members by screw fastening, or other methods as standard with fabricator.
a. Locate mechanical fasteners and install according to cold-formed steel truss component

manufacturer's instructions with screw penetrating joined members by not less than 3 exposed screw threads.

B. Care shall be taken during handling, delivery and erection. Brace, block, or reinforce truss as necessary to minimize member and connection stresses. Refer to LGSEA "Field Installation Guide".

C. Fabrication Tolerances: Fabricate trusses 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 trusses no more than plus or minus 1/8 inch (3mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
   2. Squareness: Fabricate each cold-formed steel truss to a maximum out-of-square tolerance of 1/8 inch (3mm).

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine structure, substrates and installation conditions. Do not proceed with cold-formed steel truss installation until unsatisfactory conditions have been corrected.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.2 INSTALLATION, GENERAL

A. General:
   1. Erection of trusses, including proper handling, safety precautions, installation bracing and other safeguards or procedures is the responsibility of the Contractor and Contractor's installer. Refer to LGSEA "Field Installation Guide".
   2. Exercise care and provide installation bracing required to prevent toppling of trusses during erection. Provide Ultra-Span Stabilizer™ from Aegis Metal Framing for lateral bracing.

B. Erect trusses with plane of truss webs vertical and parallel to each other, accurately located at design spacing indicated.

C. Provide proper lifting equipment, including spreader bar, suited to sizes and types of trusses required, applied at lift points recommended by truss fabricator. Exercise care to avoid damage to truss members during erection and to keep horizontal bending of the trusses to a minimum.

D. Provide framing anchors as indicated or accepted on the engineering design drawing or erection drawings. Anchor trusses securely at bearing points.

E. Install trusses plumb, square, true to line, and with connections securely fastened, according to manufacturer's recommendations.
   1. DO NOT cut truss members without prior approval of truss engineer.
   2. Fasten cold-formed steel trusses by screw fastening, welding or other methods, as standard with fabricator.
      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-formed truss manufacturer's instructions with screw penetrating joined members by not less than 3 exposed screw threads.

3. Install trusses in one-piece lengths, unless splice connections are indicated.
4. Provide installation bracing and leave in place until trusses are permanently stabilized.

F. Erection Tolerances: Install trusses 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 trusses 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.
2. Limit out-of-plane bow and plumb per LGSEA "Field Installation Guide".

3.3 ROOF TRUSS INSTALLATION

A. Install trusses per installation documents provided for in Section 1.4 (D).

B. Space trusses per sealed truss drawings.

C. Do not alter, cut, or remove truss members or connections of truss members.

D. Erect trusses with plane of truss webs plumb and parallel to each other, align, and accurately position at spacing indicated.

E. Erect trusses without damaging truss members or connections.

F. Anchor trusses securely at all points of support, per installation documents provided for in Section 1.4 (D).

G. Install all continuous bridging and permanent truss bracing per installation documents provided for in Section 1.4 (D).

H. Perform all truss-to-truss connections per installation documents provided for in Section 1.4 (D).

3.4 REPAIRS AND PROTECTION

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

END OF SECTION

SECTION 05 5200

HANDRAILS AND RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Steel pipe railings, balusters, and fittings.

B. Steel tube handrails, balusters, and fittings.

C. Wall mounted railings.

D. Floor mounted railings.

1.02 REFERENCES

A. ASTM A 53/A 53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2007.

B. ASTM A 500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2007.

C. ASTM E 935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).

D. SSPC-Paint 15 - Steel Joist Shop Paint; The Society for Protective Coatings; 1999 (Ed. 2004).

1.03 DESIGN REQUIREMENTS

A. Design railing assembly, wall rails, and attachments to resist lateral force of 75 lbs at any point without damage or permanent set. Test in accordance with ASTM E 935.

1.04 SUBMITTALS

A. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

PART 2 PRODUCTS

2.01 SUBSTITUTIONS

A. Refer to Section 01600 - Product Requirements.

2.02 STEEL RAILING SYSTEM

A. Steel Tubing: ASTM A 500, Grade B cold-formed structural tubing.

B. Pipe: ASTM A 53/A 53M, Grade B Schedule 40, black finish.
   1. Select pipe for smooth, uniform appearance.
   2. Size: NPS 1-1/4 inch (1.660 O.D.).

C. Corners Fittings: Commercial standard flush type rail fittings, welded and ground smooth.
   1. Manufacturers:
      a. Basis of Design: Model numbers for 1-1/4 inch (1.660 mm) and 1-1/2 inch (1.900 mm) pipe are by Julius Blum & Co., Inc.
      b. Other acceptable manufacturers:
         1) J.G. Braun.
         2) T&B Wagner, Inc.
   2. 90 degree elbows: #958, 959.
   3. 45 degree elbows: #930, 931.
   4. 90 degree three-way elbows: #903, 904.
   5. Wall returns: #983, 984, 985, 986.

6. Pipe splice locks: #1922, 1923 for interior steel railings; #287, 288 for stainless steel railings and for exterior steel railings.
7. Round slip flange: #910, 911.
8. Connectors: #952, 953.
9. Oval post flanges, floor: #927, 928.
10. Oval post flanges, angle: #942, 943.
11. Weld-on caps: #937, 939.
12. Other fittings: As required by project conditions.
13. Tees and crosses: Cope and weld pipe.

D. Wall Brackets: #218 for 2-1/2 inch (64 mm) projection, #220 for 3 inch (76 mm) projection.

E. Fittings: Elbows, T-shapes, wall brackets, escutcheons; cast steel.

F. Mounting: Adjustable Brackets and flanges, with steel inserts for casting in concrete. Prepare backing plate for mounting in steel stud wall construction.

G. Exposed Fasteners: Flush countersunk screws or bolts; consistent with design of railing.

H. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.03 FASTENERS AND ANCHORS

A. Material: Same as railing being fastened.

B. Type and style: Suitable for substrate.

2.04 FABRICATION

A. Fit and shop assemble components in largest practical sizes for delivery to site.

B. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.

C. Rail Ends:
1. Return rail ends to wall with wall returns.
2. Where straight rail runs are interrupted by columns, pilasters, walls, etc. terminate rail ends with pipe flanges anchored to wall.

D. Join posts, rails, and corners with one of the following methods:
1. Standard commercial corner fittings, coped tees and crosses. Weld and grind smooth.
2. Mitered corner fittings, coped tees and crosses. Weld and grind smooth.
3. Bend corners using suitable jigs so as not to crush pipe. Cope tees and crosses, and weld and grind smooth.

E. Expansion: Where railings are continuous, locate expansion joints (pipe splice locks) as indicated on the drawing, or if not indicated, at not more than 40 feet (12.2 m) o.c. for interior rails and 25 feet (m) o.c. for exterior rails, positioned 6 inches (152 mm) from posts.

F. Detail, fabricate, and dress railings to produce neat, attractive, smooth, uniform finishes that are free of surface irregularities, roughness, texture, variations in appearance, or other defects.

G. Provide anchors and plates required for connecting railings to structure.

H. Exposed Mechanical Fastenings: Provide flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

I. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

2.05 FINISHES

A. Railings Scheduled to be Painted: Prepare in accordance with SSPC SP-2 and shop prime rust inhibitive primer complying with either SSPC-Paint 15, Type I - Red Oxide of performance requirements of FS TT-P-664.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive 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, for installation as work of other sections.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects.

C. Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

3.04 ERECTION TOLERANCES

A. Maximum Offset From True Alignment: 1/4 inch.

B. Maximum Out-of-Position: 1/4 inch.

3.05 CLEANING AND PROTECTION

A. Painted Railings: Clean field welds, bolts, and damaged shop coatings. Apply touch-up primer specified in Division 9.

B. Correct minor damage to railings so that repairs are not visible. Where repairs are visible, remove and provide refabricated and refinished or new material.

END OF SECTION

SECTION 06 1000
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roofing nailers and curbs.

B. Wood furring and grounds.

C. Preservative treatment of wood.

D. Telephone and electrical panel backers.

E. Roof sheathing.

1.02 REFERENCES

A. APA E30 - Engineered Wood Construction Guide; 2007.

B. APA PRP-108 - Performance Standards and Policies for Structural-Use Panels; 2002.

C. ASTM A 153/A 153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2005.

D. AWPA C20 - Structural Lumber -- Fire Retardant Treatment by Pressure Processes; American Wood-Preservers' Association; 2003.

E. AWPA C27 - Plywood -- Fire-Retardant Treatment by Pressure Processes; 2002.

F. AWPA U1 - Use Category System: User Specification for Treated Wood; 2007.

G. PS 1 - Construction and Industrial Plywood; National Institute of Standards and Technology (Department of Commerce); 2007.

H. PS 20 - American Softwood Lumber Standard; National Institute of Standards and Technology (Department of Commerce); 2005.

1.03 SUBMITTALS

A. Product Data: Provide technical data on wood preservative materials.

1.04 QUALITY ASSURANCE

A. Plywood:
   1. Comply with APA PRP-108 where APA rated panels are specified; bearing APA trademark showing compliance with each specified requirement.

B. Marking of Treated Wood: Each piece of lumber or plywood, applied by inspection agency, and showing compliance with specified standards.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect wood products against moisture and dimensional changes. Support stacks at several uniformly spaced points to prevent deformation. Store stacks raised above ground. Cover to protect from rain and snow. Select and arrange cover to allow air circulation under and all around stacks to prevent condensation. Maintain and restore displaced coverings. Remove from the site any wood products that have been subjected to moisture or that do not comply with the specified moisture requirements.

PART 2 PRODUCTS

2.01 SUBSTITUTIONS

A. Refer to Section 01 6000 - Product Requirements.

2.02 DIMENSION LUMBER

A. Size: Provide nominal sizes indicated, complying with PS 20 except where actual sizes are specifically required.

B. Miscellaneous Lumber: Provide dimension lumber and boards necessary for the support of work specified in other sections, whether or not specifically indicated, and including but not limited to blocking, nailers, etc.
   1. Moisture content: 15 percent maximum (kiln-dry).
   2. Lumber: S4S, No. 2 or standard grade.
   3. Boards: Construction, 2 common, or No. 2 grade.

2.03 CONSTRUCTION PANELS

A. Roof Sheathing:
   1. APA rated sheathing, Exposure: 1.
   2. Edges: Tongue and groove.

B. Miscellaneous Panels:
   1. Electrical/Telephone Panel Backer: APA rated sheathing, Exposure 1, Treating Grade; fire retardant treated.

C. Thicknesses: Where nominal thicknesses are indicated, provide actual thickness as follows, providing other project requirements such as grade, span rating, exposure, etc., are met:
   1. 1/2 inch nominal: 7/16, 15/32, or 1/2 inch actual.
   2. 5/8 inch nominal: 19/32, 5/8, or 21/32 inch actual.
   3. 3/4 inch nominal: 11/16 or 3/4 actual.
   4. 1 inch nominal: 1 inch actual.
   5. 1-1/8 inch nominal: 1-1/8 inch actual.
   6. 1-1/4 inch nominal: 1-1/4 inch actual.

2.04 FASTENERS

A. Material:
   1. Interior untreated wood: Steel.
   2. Provide ASTM A 153 hot-dip dipped galvanized steel fasteners for the following:
      a. Interior fire-retardant treated wood.
      b. Preservative treated wood treated with borates.
      c. Coated or electro-plated fasteners are not acceptable.
   3. Provide Type 304 stainless steel fasteners.
      a. Exterior fire-retardant treated wood.
      b. Preservative treated wood treated with ACQ or CA-B.
   4. In contact with copper: Provide silicone bronze or copper material as specified in respective specification section.

B. Spacings: When fastening flashings and nailers to wall sheathing or structure, within 8 feet (2.4 m) of corners or end runs use 1/2 the spacing specified in this section, twice as many fasteners.

C. Provide fasteners as required by applicable codes and as specified in this section unless other types and spacings are indicated for specific uses.

D. Nails to Connect Wood Nailers and Blocking to Wood:
   1. Length to penetrate wood 1-1/4 inches (32 mm).
   2. Sized for not less than 100 lbs. withdrawal resistance.
   3. Space in 2 rows staggered at 12 inches (305 mm) on center.

E. Screws to Connect Wood to Metal Deck:

1. No. 10 sheet metal screws.
2. Space two rows staggered at 12 inches (305 mm) on center.

F. Fasteners to Connect Wood to Masonry and Concrete:
1. Expansion anchors or adhesive anchors, type suited to masonry conditions; Hilti or other manufacturer approved by the Architect.
2. 1inch diameter, unless otherwise indicated.
3. Space at 48 inches (1219 mm) on center, maximum.

G. Fasteners to Connect APA Panel Product to Steel or Wood: Type and spacing in accordance with APA E30.

2.05 WOOD TREATMENT

A. Treat all lumber and all construction panels used in building construction unless untreated material is explicitly specified by the use of the words "fire retardant or preservative treatment is not required" or similar language.
1. Except where required to be untreated, all lumber and all construction panels used in building construction shall be fire retardant treated, except pressure preservative treated lumber and construction panels are not required to be fire retardant treated.
2. Furniture, furnishings, finish carpentry, and architectural woodwork is not specified in this section and is subject to treatment requirements, if any, specified in the respective specification sections.

B. Fire Retardant Treatment:
1. Fire retardant treated lumber: AWPA C20.
2. Fire retardant treated plywood: AWPA C27.
3. Interior Type A, Low Hygroscopic, and approved by AWPA for preservative qualities in above-ground, weather-protected locations. “Dricon”; Arch Wood Treatment. Treat lumber and panels used for the following:
a. Interior uses.
b. Exterior walls (protected from direct weather exposure by other materials).
c. Roof sheathing.
4. Exterior Type: "Exterior Fire-X"; Hoover Treated Wood Products, Inc. Treat lumber and panels used for the following:
a. Wherever direct exposure to wetting will occur.

B. Pressure Preservative Treatment: Treat lumber used in the locations described below. Kiln dry after treatment to 19 percent maximum moisture content for lumber and 18 percent for plywood. Provide wood treated according to AWPA U1 with Use Category (UC) suitable for actual service encountered on the Project.
1. Treat the following according to Use Category 2 using sodium borate, retention level 0.28 PCF.
a. Treat wood in contact with roofing, flashing, or waterproofing and protected by same from exposure to weather.
b. Treat wood in contact with masonry or concrete and protected from exposure to weather.
c. Treat wood less than 18 inches above grade and protected from exposure to weather.
2. Treat the following using ACQ or CA-B: Exterior wood, exposed to weather.

PART 3 EXECUTION

3.01 INSTALLATION

A. Arrange work to use full length pieces except where lengths would exceed commercially available lengths. Discard pieces with defects that would lower the required strength or appearance of the work.

B. Cut and fit members accurately. Install plumb and true to line and level.

C. Fasten carpentry in accordance with applicable codes and recognized standards.

D. Where exposed, countersink nails and fill flush with suitable wood filler.

E. Use fasteners of appropriate type and length. Predrill members when necessary to avoid splitting wood.

3.02 MISCELLANEOUS CARPENTRY

A. Provide miscellaneous blocking, nailers, grounds, furring, and framing as shown and as required for support of facing materials, fixtures, specialty items, and trim. Cut and shape to the required size.
   1. Provide dimension lumber and boards necessary for the support of work specified in other sections or required for the support of work of other contracts, whether or not specifically indicated, and including but not limited to blocking, nailers, etc.
   2. Provide nailers on roof deck equal in thickness to roofing insulation.
      a. Drawings do not illustrate actual thickness of insulation at locations to receive tapered insulation, saddles, and crickets.
   3. Do not space blocking or nailers; install continuous lengths with butt joints not exceeding 1/8-inch per 8 foot.

B. Install wood furring plumb and level; shim as necessary to bring true to plane; install closure strips at ends perpendicular to main furring direction.

3.03 INSTALLATION OF CONSTRUCTION PANELS

A. Install construction panels at locations indicated and in accordance with APA E30.

B. Fastening methods:
   1. Fasten roof sheathing to metal framing with self-drilling screws.
      a. At panel edges, provide one panel clip per span.
      b. Provide solid blocking under panel edges other than intact tongue and groove edges.
   2. Screw miscellaneous plywood panels to supports.

END OF SECTION

SECTION 06 1600
SHEATHING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Gypsum board sheathing.

1.02 REFERENCES

A. ASTM C 1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2007.

B. ASTM C 1177/C 1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2006.

C. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2008.

D. ASTM E 136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C; 2004.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's specifications, installation instructions, and general recommendations for each major product required. Include data substantiating that products to be furnished comply with requirements of the contract documents.

1.04 DELIVERY, STORAGE, AND PROTECTION

A. Keep materials dry at all times.

B. Protect materials against exposure to weather and against contact with damp or wet surfaces.

C. Protect materials from excessive moisture in shipment, storage, and handling.

D. Deliver materials in manufacturer's unopened packages, and store in dry place with adequate air circulation.

E. Stack products of this section carefully to provide air circulation within stacks.

PART 2 - PRODUCTS

2.01 SUBSTITUTIONS

A. Refer to Section 01 6000 - Product Requirements.

2.02 GYPSUM BOARD SHEATHING

A. Fiberglass Faced Gypsum Sheathing; ASTM C 1177:
   1. Core: Water-resistant silicone-treated gypsum core.
   2. Facers: Alkali-resistant fiberglass mat front and back.
   3. Thickness: 5/8 inch.
   4. Surface burning hazard (ASTM E 84): 0 flame spread, 0 smoke developed.
   5. Noncombustible when tested in accordance with ASTM E 136.
   6. Manufacturer:
      a. GP Gypsum Corporation; Dens-Glass Gold: www.gp.com/gypsum.

2.03 FASTENERS

A. Screws: ASTM C 1002; self-drilling type, cadmium-plated.

B. Gypsum Board Sheathing:
   1. Fasteners for attaching gypsum board sheathing to metal framing:

a. 12 to 22 gage steel framing: Type S-12 fine thread, rust resistant, drill point dry wall screws.
b. Over light gage metal framing or furring: Type S fine thread, rust resistant, sharp point dry wall screws.
c. Length: 1-1/4 inch (32 mm) minimum #6 for 5/8 inch (16 mm) thick sheathing.
d. Length: 1 inch (25 mm) minimum #6 for 1/2 inch (13 mm) thick sheathing.

2.04 ACCESSORIES

A. Joint and Fastener Sealant: Dow Corning, Inc.; 795 Building Sealant; www.dowcorning.com.
1. Backer rod: Closed cell foam complying with the requirements of the joint sealer manufacturer.

B. Self-Adhesive Tape: W.R. Grace & Co.; Product Vicor Plus Self-Adhered Flashing: www.graceconstruction.com.
1. Composite material: 22-mil thick rubberized asphalt adhesive bonded to 3-mil thick, high density, cross-laminated polyethylene film.
2. Release sheet to protect adhesive layer.

C. Self-Adhesive Tape Primer: W.R. Grace & Co.

D. Sheathing tape:
1. 3M Corporation; Product Contractor Sheathing Tape No. 8086, 2 inch (51 mm) minimum width; www.3m.com.
2. 3M Corporation; Product Quik-Tape, 2 inch (51 mm) minimum width; 222.3m.com.
3. Perma Glas-Mesh Corporation; Product Perma-Tite Self-Adhering Fiberglass Joint Tape, 2 inch (51 mm) minimum width.

PART 3 EXECUTION

3.01 EXAMINATION

A. Inspect substrates and conditions under which the work of this section will be performed, and verify that installation properly may commence. Do not proceed with the work until unsatisfactory conditions have been resolved fully.

3.02 SHEATHING INSTALLATION

A. Comply with manufacturer's instructions, except where more stringent requirements are shown or specified, and except where project conditions require extra precautions or provisions to ensure satisfactory performance of the work.

B. Install sheathing over framing. Butt joints together. Layout work and use appropriate length material to avoid end joints. Joints shall occur over framing members. Stagger end joints between adjacent panels.

C. Fit sheathing snugly around windows, doors, and other openings.

D. Drive fasteners tight against and flush with sheathing surface. Do not countersink fasteners.

E. Locate fasteners not closer than 3/8 inch (10 mm) from edge and ends of panels.

F. Space fasteners at not more than 8 inches (203 mm) on center at perimeter and field, unless closer spacing is indicated on the drawings.

G. Moisture Protection: Treat cut edges and holes in sheathing with sealant.

H. Schedule installation of sheathing and of subsequent cladding to avoid exposure of sheathing beyond manufacturer's allowable limits.

I. Replace sheathing that is damaged, fails to meet with reference standard properties for new sheathing at the time permanent cladding is installed, or is otherwise unsuitable.

3.03 FIELD QUALITY CONTROL

A. Inspect completed installation and notify the Architect in writing.

B. Do not conceal sheathing without approval.

3.04 CLEANING

A. During progress of the work, remove from project site all discarded materials, rubbish, and debris resulting from the work.

B. Upon completion, clean all surfaces which have become soiled or coated as a result of work of this section, using proper methods which will not scratch or otherwise damage finished surfaces.

1. For cleaning, use only products and techniques acceptable to manufacturer of products being cleaned.

3.05 PROTECTION

A. Where sheathing barrier is damaged before installation of permanent cladding, repair in accordance with manufacturer's recommendations and to the satisfaction of the Architect.

END OF SECTION

SECTION 06 2000
FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Finish carpentry items.

B. Wood door frames, glazed frames.

C. Wood casings and moldings.

1.02 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 06 1000 - Rough Carpentry: Support framing, grounds, and concealed blocking.

C. Section 08 1416 - Flush Wood Doors.

D. Section 08 5200 - Wood Windows.

E. Section 09 9000 - Painting and Coating: Painting and finishing of finish carpentry items.

1.03 REFERENCE STANDARDS

A. AWPA U1 - Use Category System: User Specification for Treated Wood; American Wood-Preservers' Association; 2009.

B. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; Hardwood Plywood & Veneer Association; 2004.

C. PS 1 - Structural Plywood; 2007.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with plumbing rough-in, electrical rough-in, and installation of associated and adjacent components.

B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data:

C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.

1. Provide the information required by AWI/AWMAC/WI Architectural Woodwork Standards.

D. Samples: Submit two samples of wood trim 12 inches long.

1.06 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect work from moisture damage.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

A. Quality Grade: Unless otherwise indicated provide products of quality specified by AWI//AWMAC/WI Architectural Woodwork Standards for Premium Grade.

B. Surface Burning Characteristics: Provide materials having fire and smoke properties as required by applicable code.

2.02 WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

2.03 SHEET MATERIALS

A. Softwood Plywood Not Exposed to View: Any face species, veneer core; PS 1 Grade A-B; glue type as recommended for application.

B. Hardwood Plywood: Face species as indicated, plain sawn, book matched, medium density fiberboard core; HPVA HP-1, Grade AA, Type AWI Custom; glue type as recommended for application.

2.04 FASTENINGS

A. Concealed Joint Fasteners: Threaded steel.

2.05 WOOD TREATMENT

A. Factory-Treated Lumber: Comply with requirements of AWPA U1 - Use Category System for pressure impregnated wood treatments determined by use categories, expected service conditions, and specific applications.

B. Wood Preservative by Pressure Treatment (PT Type): AWPA U1 Treatment using water borne preservative with 0.25 percent retainage.

C. Shop pressure treat wood materials requiring fire rating to concealed wood blocking.

D. Provide identification on fire retardant treated material.

E. Redry wood after pressure treatment to maximum 19 percent moisture content.

2.06 FABRICATION

A. Shop assemble work for delivery to site, permitting passage through building openings.

B. Fit exposed sheet material edges with 3/8 inch matching hardwood edging. Use one piece for full length only.

C. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

2.07 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.

B. Apply wood filler in exposed nail and screw indentations.

C. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and is of type recommended for the applicable finish.

D. Finish work in accordance with AWI/AWMAC/WI Architectural Woodwork Standards, Section 5 - Finishing for Grade specified and as follows:

E. Back prime woodwork items to be field finished, prior to installation.

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 INSTALLATION

A. Install work in accordance with AWI/AWMAC/WI Architectural Woodwork Standards requirements for grade indicated.

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.

3.03 PREPARATION FOR SITE FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

B. Site Finishing: See Section 09 9000.

C. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

3.04 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

SECTION 06 4100
CUSTOM CABINETS AND WOODWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Plastic Laminate Cabinets.

B. Plastic Laminate Countertops.

C. Cabinet Hardware.

1.02 REFERENCES

A. AHA A135.4 - Basic Hardboard; American Hardboard Association; 2004.

B. ANSI A208.1 - American National Standard for Particleboard; 1999.

C. ANSI A208.2 - American National Standard for Medium Density Fiberboard for Interior Use; 2002.

D. AWI/AWMAC (QSI) - Architectural Woodwork Quality Standards Illustrated; Architectural Woodwork Institute and Architectural Woodwork Manufacturers Association of Canada; 2005, 8th Ed., Version 2.0.

E. BHMA A156.9 - American National Standard for Cabinet Hardware; Builders Hardware Manufacturers Association; 2003 (ANSI/BHMA A156.9).

F. NEMA LD 3 - High-Pressure Decorative Laminates; National Electrical Manufacturers Association; 2005.

1.03 SUBMITTALS

1.04 QUALITY ASSURANCE

1.05 DELIVERY, STORAGE, AND PROTECTION

A. Protect units from moisture damage.

1.06 PROJECT CONDITIONS

A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS

2.01 CABINET CONSTRUCTION

A. Perform cabinet construction in accordance with AWI Section 400 as follows:
   1. Plastic Laminate Cabinets: Custom quality.

2.02 PANEL MATERIALS

A. Particleboard: ANSI A208.1; medium density industrial type, composed of wood chips bonded with interior grade adhesive under heat and pressure; sanded faces; thickness as required; use for components indicated on drawings.

B. Medium Density Fiberboard (MDF): ANSI A208.2; composed of wood fibers pressure bonded with moisture resistant adhesive to suit application; sanded faces; thickness as required.

C. Hardboard: AHA A135.4; Pressed wood fiber with resin binder, Class 1 - Tempered, 1/4 inch thick, smooth two sides (S2S). Use for drawer bottoms, dust panels, and other components indicated on drawings.

2.03 LAMINATE MATERIALS

A. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications and as follows:
   1. Exposed Surfaces: HGS, 0.048 inch nominal thickness, through color, colors as scheduled, finish as scheduled.
   2. Cabinet Liner: CLS, 0.020 inch nominal thickness, through color, colors as scheduled, finish as scheduled.
   3. Laminate Backer: BKL, 0.020 inch nominal thickness, undecorated; for application to concealed backside of panels faced with high pressure decorative laminate.

B. Surface Color and Pattern: reference Section 090615.

2.04 ACCESSORIES

A. Adhesive: Type recommended by fabricator to suit application.

B. Fasteners: Size and type to suit application.

C. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel, or chrome-plated finish in exposed locations.

D. Concealed Joint Fasteners: Threaded steel.

E. Grommets: Standard plastic, painted metal, or rubber grommets for cut-outs, in color to match adjacent surface.

2.05 HARDWARE

A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.

B. Adjustable Shelf Supports: Standard side-mounted system using recessed metal shelf standards and coordinated self rests, satin chrome finish, for nominal 1 inch spacing adjustments.

C. Drawer and Door Pulls: "U" shaped wire pull, stainless steel with satin finish, 4 inch centers.

D. Cabinet Locks: Keyed cylinder, two keys per lock, master keyed, steel with satin finish.

E. Catches: Magnetic.

F. Drawer Slides:
   1. Manufacturers:
      a. Basis of Design: Accuride International, Inc.
      b. Hafele America Co.
      c. Knape & Vogt Manufacturing Company.
   2. Light/Medium Duty Drawer Slides For Drawers 24 inches Wide or Less: Accuride 7434 with overtravel.
      a. Overtravel: 1 inch.
      b. Type: All ball bearing, full extension, rail-mounted, hold-in detent, smooth progressive movement.
      c. Capacity: 100 pounds per pair for 18-inch slide length.
      d. Finish: Clear zinc.
   3. Heavy Duty Drawer Slides For Drawers 42 inches Wide or Less and Standard File Drawers: Accuride 3640.
      a. Type: All ball bearing, full extension, rail/bracket-mounted, hold-in detent, smooth progressive movement with 1 inch overtravel.
      b. Capacity: 200 pounds per pair for 18-inch slide length.
      c. Finish: Clear zinc.

4. Extra Heavy Duty Drawer Slides for Lateral File Drawers: Accuride 9301.
   a. Type: All ball bearing, full extension, rail/bracket-mounted, hold-in detent, smooth progressive movement with 1 inch overtravel.
   b. Capacity: 400 pounds per pair for 18-inch slide length.
   c. Finish: Clear zinc.

G. Hinges: European style concealed self-closing type, 120 or 125 degree opening angle, steel with polished finish.
   1. Product:
      a. Hafele America Co.; Duomatic Hinges, 200 Series, No. 329.03.558.
      b. Julius Blum, Inc.; 125 Series, No. 75M5580.
      c. Salice America Inc.; Series 200, No. C2R9A99.

2.06 FABRICATION - CABINETS

A. Cabinet Style: Flush overlay.

B. Cabinet Doors and Drawer Fronts: Flush style.

C. Drawer Construction Technique: Dovetail joints.

D. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.

E. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

F. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.

G. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.
   1. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
   2. Cap exposed plastic laminate finish edges with material of same finish and pattern.

2.07 FABRICATION - COUNTERTOPS

A. Edge Detail: As indicated on drawings.

B. Plastic Laminate:
   1. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes.
   2. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
   3. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises.
   4. Locate counter butt joints minimum 2 feet from sink cut-outs.
   5. Cap exposed plastic laminate finish edges with material of same finish and pattern.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION - CABINETS

A. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.

B. Use concealed joint fasteners to align and secure adjoining cabinet units.

C. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.

D. Secure cabinets to floor using appropriate angles and anchorages.

E. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

3.03 INSTALLATION - COUNTERTOPS

A. Install components plumb, level true and straight in accordance with approved shop drawings, project installation details and manufacturer's printed instructions. Shim as necessary using concealed shims.

B. Provide inconspicuous joints in finished work.

C. Attach top securely to base unit or support brackets.

D. Provide side splashes where countertops abut vertical walls.

E. Provide back splashes where countertops abut vertical walls.

3.04 ADJUSTING

A. Adjust installed work.

B. Adjust moving or operating parts to function smoothly and correctly.

3.05 CLEANING

A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

SECTION 07 2100
BOARD AND BATT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Batt/Blanket Insulation in:
   1. Metal stud walls.
   2. Metal ceiling joists.

1.02 REFERENCES

A. ASTM C 665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2006.

1.03 SUBMITTALS

A. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

1.04 ENVIRONMENTAL REQUIREMENTS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 SUBSTITUTIONS

A. Refer to Section 01 6000 - Product Requirements.

2.02 BATT/BLANKET INSULATION MATERIALS

A. Batt/Blanket Insulation: ASTM C 665; preformed mineral wool fiber blanket made from rock or slag; friction fit, conforming to the following:
   1. Unfaced.
   2. Width of Batt/Blankets: Sized for tight friction fit between faces of studs without sagging or slumping.
   3. Depth of Mineral Wool Batts installed in Stud Walls / minimum rated R-value:
      a. 2x6 steel studs: R-23, 6".
      b. 2x8 steel studs: R-23, 6" batt plus an R-7, 2" batt.
   4. Depth of Glass Fiber Batts installed between Ceiling Joists / minimum rated R-value:
      a. Above ACT Ceilings: R-38, 10-1/4" ("cathedral" type batt).
   5. Manufacturers:
      a. CertainTeed Corporation: www.certainteed.com.
      b. Johns Manville International, Inc: www.johnsmanville.com.
      c. Owens Corning Corp: www.owenscorning.com.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify substrate surfaces are flat, free of honeycomb, fins, or irregularities.

3.02 BATT/BLANKET INSTALLATION

A. Install insulation in accordance with manufacturer's instructions, without gaps or voids.

B. Install in exterior wall spaces.

C. Install in exterior ceiling spaces.

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

E. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

3.03 MISCELLANEOUS VOIDS

A. Fill shim spaces around doors, windows, and other openings with insulation. Fill voids and crevices with insulation.

3.04 PROTECTION OF FINISHED WORK

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 07 2510
WEATHER-RESISTANT BARRIER ON WALLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water-Resistive Barrier: Materials to keep liquid water from passing through exterior walls, joints between exterior walls and roof, joints around frames of openings in exterior walls, and joints around penetrations through exterior walls.

B. Air Barrier: Materials to keep air from passing through exterior walls, joints between exterior walls and roof, joints around frames of openings in exterior walls, and joints around penetrations through exterior walls.

1.02 SUBMITTALS

A. Product Data: Indicate material characteristics, performance criteria, and limitations.

B. Shop Drawings: Provide drawings of special joint conditions.

C. Manufacturer's Installation Instructions: Indicate preparation, installation methods, storage requirements, and temperature limitations during and after installation.

D. Reports: Submit reports signed by Contractor, installer, and membrane manufacturer's representative of:
   1. Preapplication review.
   2. Completion inspections.

1.03 QUALITY ASSURANCE

A. Preapplication Review: Schedule a meeting before start of installation with installer and membrane manufacturer's representative to review procedures for substrate preparation and application.
   1. Review contract document requirements, manufacturer's product data, and application instructions.
   2. Manufacturer’s representative shall instruct installers in proper installation procedures, and shall be available throughout project for trouble shooting upon request.

1.04 MOCK-UP

A. Construct mock-up demonstrating each typical condition, including perimeters, transitions to other envelope materials such as waterproofing and roofing, penetrations, each type of substrate, and openings such as windows, doors, and louvers.

B. Obtain the approval of the manufacturer's designated representative before beginning full production.

C. Obtain the Architect's approval before beginning full production.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Maintain temperature and humidity recommended by the materials manufacturers before, during and after installation.

B. Do not apply coatings when there is a chance that frost may occur before coating is fully cured.

1.06 WARRANTY

A. Provide Special Project Warranty specified in Section 01 7810.

PART 2 PRODUCTS

2.01 MEMBRANE MANUFACTURERS

A. Contractor shall select a single manufacturer to provide membrane products of this Section and of Section 07 6500.
   1. Henry Company.
   2. Tremco.
   3. W.R. Grace.
   4. W.R. Meadows.

2.02 WALL MEMBRANE

A. Air and Liquid Water Barrier - Water Vapor Permeable: Full Membrane on the Entire Outside Surface of Exterior Wall Substrates: Rolled or sprayed coating forming an elastomeric barrier that is water vapor permeable.
   1. Henry: Air-Bloc 31. Application thickness: 90 mils wet, 45 mils dry.
   2. Tremco: ExoAir 220. Application thickness: 70 mils wet, 40 mils dry.
   3. W.R.Grace: Perm-A-Barrier VP. Application thickness: 90 mils wet, 45 mils dry.
   4. W.R. Meadows: Air-Shield LMP. Application thickness: 90 mils wet, 45 mils dry.

B. Application Thicknesses: Thicknesses specified above are nominal. Coverage will vary according to substrate profile and project conditions. Apply liquid membrane to comply with all of the following:
   1. Apply liquid membrane at coverage rate so that the completed and cured membrane will be pin-hole free.
   2. Apply liquid membrane at coverage rate so that the average dry thickness of the completed and cured membrane will be not less than that specified and so that its minimum thickness shall be not less than that 90 percent of that specified.
   3. Specified thicknesses are in addition to the thickness of detail coat and transition sheet.

2.03 TRANSITION SHEET MATERIALS

A. Seal At Adjacent Materials (doors, windows, louvers, dissimilar substrates, etc.):
   1. Rubberized asphalt or butyl rubber, bonded to sheet polyethylene, self-adhesive.
   2. Thickness: At least 40 mils.
   3. Products:
      a. Henry: Blueskin SA or TWF.
      b. Tremco: ExoAir 110 or TWF.
      c. W.R.Grace: Perm-A-Barrier Wall Flashing or Detail Membrane.
      d. W.R. Meadows: Air-Shield shelf-adhering sheet membrane.

B. Solvent Base Primer:
   1. Rubber-based, solvent dispersed liquid for substrate preparation.
   2. Products:
      a. Henry: Blueskin Primer.
      b. Tremco: ExoAir 10 Primer.
      c. W. R. Grace & Co.: B2 Low VOC Content Primer.
      d. W.R. Meadows: Mel-Prime VOC Solvent-Based Primer.

C. Mastic: Trowel or caulking grade rubberized mastic.
   1. Products:
      a. Henry: Air-Boc 06 Trowel Grade.
      b. Tremco: Dymonic FC.
      c. W. R. Grace & Co.: Bituthene Liquid Membrane.
      d. W.R. Meadows: Air-Shield Joint Filler

D. Accessories:

1. Mesh Tape: Fiber glass mesh; 4 to 6 inches wide; type as recommended by membrane manufacturer.
2. Tape for Plastic Substrates with W.R. Grace: Pre-Pruf Tape at plastic substrates indicated in PART 3.

2.04 INSULATION MATERIALS

A. Manufacturers: Provide all insulation products from a single manufacturer.

B. Sprayed-In-Place Foam: Slightly expansive, polyurethane insulating foam sealant, ASTM C1620, generating an air-tight, water-resistant seal and tenacious bond to adjacent surfaces.
1. Apparent Density: 1.6 - 1.8 psf per ASTM D1622.
2. Overall Density: 2.4 - 2.9 pcf.
3. Dimensional Stability: Less than 1.5% volume change per ASTM D2126 at 1 week.
4. Open Cell Content: less than 8% per ASTM D6226.
5. Flame spread / Smoke developed: Not greater than 10 / 20.
6. Product: Dow Great Stuff Pro.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and conditions are ready to accept the work of this section.

3.02 PREPARATION

A. Remove loose or foreign matter which might impair adhesion of materials.

B. Clean and prime substrate surfaces to receive adhesives in accordance with manufacturer's instructions.

C. Ensure that substrates are clean, dry, and dust-free.

3.03 WALL MEMBRANE INSTALLATION

A. Install materials on the entire outside surface of exterior walls, including:
1. Sheathing.

B. Install materials in accordance with manufacturer's instructions.

C. Install membrane in conjunction with materials described in other sections to provide a continuous, sealed barrier on the exterior enclosure of the building.

D. Treat joints in sheathing substrates by applying detail coating of membrane as specified below prior to general membrane application. Untreated butt joints of any width are not acceptable (even if allowed by manufacturer's minimum recommendations).
1. Fill minor gaps with mastic or caulk and allow to cure before applying mesh tape and membrane liquid. (Treat gaps over manufacturer's permitted width with transition membrane.)
2. Apply mesh tape to butt joints in sheathing.
3. Apply detail coating of membrane to joints and extending 2 inches onto substrate beyond joint tape.
4. Treat inside corners joints by applying a 1-inch fillet of mastic, allowing it to cure, then following with a detail coating of membrane extending 6 from each side of the corner. (Where manufacturer recommends transition sheet at inside corners, install transition sheet.)
5. Install transition sheet at outside corners. Extend sheet as recommended by membrane manufacturer, but in no case less than 3 inches each side of the corner and on to face of wall (6 inches total).

E. Apply transition sheet at juncture of membrane and other materials and at interruptions such as beams, columns, or other dissimilar substrates. Width of transition sheet as recommended by membrane manufacturer, but in no case less than 3 inches on each side of joint (6 inches total).

F. Install transition sheet at window, door, louver, and other openings. Wrap transition sheet into opening as recommended by membrane manufacturer, but in no case less than 3 inches into opening and 3 inches on to face of wall (6 inches total).

G. Install transition sheet at control and expansion joints. Apply transition sheet across joints as recommended by membrane manufacturer, but in no case less than 3 inches each side joint on to face of wall (6 inches total).

H. Transition Sheet:
   1. Prime substrates before installing transition sheet using a detail coating of membrane or primer, as recommended by manufacturer.
   2. Apply sheet material to primed surface, and firmly roll the entire surface of sheet material with a roller not more than 4 inches wide (use fingers or a blunt tool at confined corners and crevices) to ensure firm, permanent bond without voids or fishmouths or blisters.
   3. Seal laps and perimeters of sheet with mastic.

I. Penetrations Through Membrane, Such as Pipes, Conduit, Electrical Boxes, Etc.: Seal around penetrations through the membrane. Ensure that penetrations are securely fixed and anchored before sealing.
   1. Install a fillet of mastic around penetration to provide a smooth transition between the penetrating object and the adjacent substrate. Allow to cure. Apply membrane at least 2 inches onto the adjacent substrate and at least 2 inches onto the penetration.
      a. Grace: For plastic pipes and similar substrates, install tie-in tape before sealing.

J. Apply liquid membrane using manufacturer's recommended equipment. Ensure that adequate film thickness is applied, and that film is continuous without pinholes, holidays, or thin spots or excessively thick spots.
   1. Lap liquid membrane onto transition sheet.

K. Apply within recommended application temperature ranges.

L. Form a continuous seal between the exterior wall membrane and roofing material.

3.04 SELF-ADHESIVE SHEET AT CLADDING ANCHORS AND OTHER PENETRATIONS

A. Where exterior cladding anchors (masonry veneer, metal cladding, and other penetrating materials) are mechanically fastened through the weather membrane, provide transition sheet material underneath of anchors. Size sheet material to extend approximately 1/2 inch beyond the edges of the anchor. Ensure that the anchor, securely fastened, forms a tight compression seal against sheet material and weather membrane to create an air-tight and weather-tight seal.

B. Where sheet material would not form a practicable seal around penetrations, seal such penetrations with mastic to form an air-tight and weather-tight seal.

C. Other Openings and Penetrations: Seal and provide flashings for other openings so as to provide an air-tight, weather-tight barrier.

3.05 SPRAYED-IN-PLACE FOAM

A. Install SIP foam around, between, and behind penetrations through or interruptions in board insulation, to fill unavoidable minor gaps and irregularities in board insulation, and in all cases so as to form a continuous, uninterrupted plane of thermal insulation.

B. Snug, butted joints or snug shiplap joints in board insulation do not need to be sprayed.

C. Install SIP foam to fill the void between walls and the frames of doors, windows, louvers, and other openings, except where grout-filled frames occur.

3.06 FIELD QUALITY CONTROL

A. Just prior to covering, inspect weather-resistant barrier to ensure that it forms a continuous, uninterrupted barrier over the entire wall surface in full compliance with this specification and the manufacturer's installation instructions. Ensure that the barrier is undamaged by exposure, weather, or other inadvertent damage.

B. Notify the Architect when Contractor's inspection is complete.

C. Obtain wall membrane manufacturer representative's inspection of the completed installation prior to covering.

D. Do not cover installed weather barriers until required inspections have been completed.

3.07 PROTECTION

A. During construction and until permanent protection is in place, provide temporary protective weather-proof sheeting or other covering to prevent moisture intrusion into tops of walls and through back side of walls.

B. Do not allow materials to be exposed to sunlight or weather for periods longer than recommended by manufacturer.

C. Protect installed materials from damage by subsequent trades. Repair inadvertent damage before covering with other materials.

END OF SECTION

SECTION 07 2616
UNDERSLAB VAPOR RETARDERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sheet vapor retarders.

B. Tape.

1.02 REFERENCES

A. ASTM E 96/E 96M - Standard Test Methods for Water Vapor Transmission of Materials; 2005.

B. ASTM E 1643 - Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill under Concrete Slabs; 1998 (Reapproved 2005).

C. ASTM E 1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 1997 (Reapproved 2004).

1.03 SUBMITTALS

A. Product Data: Provide product data, installation instructions, and standard details illustrating sealing of laps, penetrations, and perimeters and other typical conditions.

PART 2 PRODUCTS

2.01 SUBSTITUTIONS

A. Refer to Section 01 6000 - Product Requirements.

2.02 VAPOR RETARDERS

A. Vapor Retarder: ASTM E 1745, Class A, polyolefin or polyethylene sheet.
   1. Products:
      a. Raven Industries; VaporBlock 15: www.ravenind.com.
      b. Reef Industries, Inc.; Griffolyn 15: www.reefindustries.com.
      c. Fortifiber Corporation; Moistop Ultra 15: www.fortifiber.com.
   2. Thickness: 15 mils.
   3. Puncture Resistance (ASTM D-1709B): Not less than 3100 grams.
   4. Water Vapor Permeance (ASTM E 96 Procedure E): Not greater than 0.025 perms.

2.03 ACCESSORIES

A. Tape: Pressure sensitive; compatible with sheet material.
   1. Fortifiber Corporation; Moistop Tape.
   2. Raven Industries; Dura-Tape.
   3. Reef Industries, Inc.; Fab Tape.

B. Pipe Boots: Factory fabricated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and conditions are ready to accept the work of this section.

3.02 PREPARATION

A. Remove large, sharp, and foreign matter which might impair adhesion of materials.

B. Surfaces to receive tape must be clean and dry.

3.03 INSTALLATION

A. Vapor Retarder: Place, protect, and repair vapor retarder sheets according to ASTM E 1643 and manufacturer's written instructions.
   1. Install vapor retarder over the compacted base specified for the concrete slab.
   2. Install vapor retarder to provide continuous sealed barrier under concrete slab. Install with longest dimension of sheets parallel to the direction of the concrete pour.
   3. Lay vapor barrier over footings and tape to foundation walls.
   4. Lap seams between adjacent sheets of vapor barrier material at least 6 inches. Tape continuously along seams.
   5. Seal laps, penetrations, and perimeters in accordance with manufacturer's instructions.

END OF SECTION

SECTION 07 3113
ASPHALT SHINGLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Asphalt shingle roofing.

B. Flexible sheet membranes for eave protection, underlayment, and valley protection.

C. Associated metal flashings and accessories.

1.02 REFERENCE STANDARDS

A. ASTM D 225 - Standard Specification for Asphalt Shingles (Organic Felt) Surfaced with Mineral Granules; 2007.

B. ASTM D 226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2006.

C. ASTM D 1970 - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2009.

D. ASTM D 3462 - Standard Specification for Asphalt Shingles Made From Glass Felt and Surfaced With Mineral Granules; 2009a.

E. ASTM D 4586 - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007.

F. NRCA MS104 - The NRCA Steep Roofing Manual; National Roofing Contractors Association; 2001, Fifth Edition, with interim updates.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Samples: Submit two samples of each shingle color indicating color range and finish texture/pattern ; for color selection.

C. Manufacturer's Instructions: Indicate installation criteria and procedures.

1.04 QUALITY ASSURANCE

A. Perform Work in accordance with the recommendations of NRCA Steep Roofing Manual.

1.05 MOCK-UP

A. Provide mock-up of 100 sq ft, including underlayment.

B. Locate where directed.

C. Mockup may remain as part of the Work.

1.06 FIELD CONDITIONS

A. Do not install shingles or eave protection membrane when surface temperatures are below 45 degrees F.

PART 2 PRODUCTS

2.01 SHINGLES

A. Asphalt Shingles: Asphalt-coated glass felt, mineral granule surfaced, complying with ASTM D 3462; Class A fire resistance.

2.02 SHEET MATERIALS

A. Eave Protection Membrane: Asphalt-saturated organic roofing felt, unperforated, complying with ASTM D 226 , Type I ("No.15").

B. Underlayment: Asphalt-saturated organic roofing felt, unperforated, complying with ASTM D 226 , Type I ("No.15").

C. Flexible Flashing: Self-adhering polymer-modified asphalt sheet complying with ASTM D 1970; 40 mil total thickness; with strippable treated release paper and polyethylene sheet top surface.

2.03 ACCESSORIES

A. Nails: Standard round wire shingle type, of hot-dipped zinc coated steel, 12 gage, 0.105 inch shank diameter, 3/8 inch head diameter, of sufficient length to penetrate through roof sheathing or 3/4 inch into roof sheathing or decking.

B. Plastic Cement: ASTM D 4586, asphalt roof cement.

C. Lap Cement: Fibrated cutback asphalt type, recommended for use in application of underlayment, free of toxic solvents.

D. Ridge Vents: Plastic, extruded with vent openings that do not permit direct water or weather entry; flanged to receive shingles.

2.04 METAL FLASHINGS

A. Metal Flashings: Provide sheet metal eave edge, gable edge, ridge, open valley flashing, and other flashing indicated.
   1. Form flashings to profiles indicated on Drawings.
   2. Form sections square and accurate to profile, in maximum possible lengths, free from distortion or defects detrimental to appearance or performance.
   3. Hem exposed edges of flashings minimum 1/4 inch on underside.
   4. Coat concealed surfaces of flashings with bituminous paint.

B. Sheet Metal: Stainless steel, as specified in Section 07 6200.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions prior to beginning work.

B. Verify that deck is of sufficient thickness to accept fasteners.

C. Verify that roof penetrations and plumbing stacks are in place and flashed to deck surface.

D. Verify roof openings are correctly framed.

E. Verify deck surfaces are dry, free of ridges, warps, or voids.

3.02 PREPARATION

A. Seal roof deck joints wider than 1/16 inch with deck tape.

B. At areas where eave protection membrane is to be adhered to substrate, fill knot holes and surface cracks with latex filler.

C. Broom clean deck surfaces before installing underlayment or eave protection.

D. Install eave edge flashings tight with fascia boards. Weather lap joints 2 inches and seal with plastic cement. Secure flange with nails spaced ____ inches on center.

3.03 INSTALLATION - EAVE PROTECTION MEMBRANE

A. Install eave protection membrane from eave edge to minimum 4 ft up-slope beyond interior face of exterior wall.

B. Apply 4 inch wide band of plastic cement over deck flange of eave edge flashings, and embed an 18 inch wide strip of eave protection membrane. Place starter strip with eave edge flush with face of flashings. Secure in place. Lap ends minimum 6 inches.

C. Apply lap cement at rate of approximately 1 1/4 gal/100 sq ft over starter strip.

D. Starting from lower edge of starter strip, lay additional 36 inch wide strips in lap cement, to produce a two ply membrane. Weather lap plies minimum 19 inches and nail in place. Lap ends minimum 6 inches. Stagger end joints of each consecutive ply.

3.04 INSTALLATION - UNDERLAYMENT

A. At Roof Slopes Greater Than 4:12 : Install underlayment perpendicular to slope of roof, with ends and edges weather lapped minimum 4 inches. Stagger end laps of each consecutive layer. Nail in place. Weather lap minimum 4 inches over eave protection.

B. Items projecting through or mounted on roof: Weather lap and seal watertight with plastic cement.

3.05 INSTALLATION - VALLEY PROTECTION

A. Install flexible flashing in accordance with manufacturer's instructions.

B. Weather lap joints minimum 2 inches.

C. Install one layer of sheet metal flashing, minimum 24 inches wide, centered over open valley and crimped to guide water. Weather lap joints minimum 2 inch wide band of lap cement along each edge of first, press roll roofing into cement, and nail in place minimum 18 inches on center, 1 inch from edges.

3.06 INSTALLATION - METAL FLASHING AND ACCESSORIES

A. Weather lap joints minimum 2 inches and seal weather tight with plastic cement.

B. Secure in place with nails at 16 inches on center. Conceal fastenings.

C. Items Projecting Through or Mounted on Roofing: Flash and seal weather tight with plastic cement.

3.07 INSTALLATION - SHINGLES

A. Install shingles in accordance with manufacturer's instructions.
   1. Fasten individual shingles using 4 nails per shingle, or as required by code, whichever is greater.
   2. Fasten strip shingles using 4 nails per strip, or as required by code, whichever is greater.

B. Place shingles in straight coursing pattern with 5 inch weather exposure to produce double thickness over full roof area. Provide double course of shingles at eaves.

C. Project first course of shingles 3/4 inch beyond fascia boards.

D. Extend shingles 1/2 inch beyond face of gable edge fascia boards.

E. Extend shingles on one slope across valley and fasten. Trim shingles from other slope 2 inches from valley center line to achieve closed cut valley, concealing the valley protection.

F. Cap hips with individual shingles, maintaining 5 inch weather exposure. Place to avoid exposed nails.

G. After installation, place one daub of plastic cement, one inch diameter under each individual shingle tab exposed to weather, to prevent lifting.

H. Coordinate installation of roof mounted components or work projecting through roof with weather tight placement of counterflashings.

I. Complete installation to provide weather tight service.

3.08 PROTECTION

A. Do not permit traffic over finished roof surface.

END OF SECTION

SECTION 07 6200
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, and other items indicated in Schedule.

B. Precast concrete splash pads.

1.02 REFERENCE STANDARDS

A. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2003.

B. ASTM D 4586 - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007.

C. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association; 2003.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Samples: Submit two samples, _6_x_6_ inch in size illustrating material of typical valley condition.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA Architectural Sheet Metal Manual requirements and standard details, except as otherwise indicated.

B. Fabricator and Installer Qualifications: Company specializing in sheet metal work with 5 years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

A. Stainless Steel: ASTM A 666 Type 304, soft temper, 0.015 inch thick; smooth No. 4 finish.

2.02 ACCESSORIES

A. Fasteners: Stainless steel , with soft neoprene washers.

B. Slip Sheet: Rosin sized building paper.

C. Primer: Zinc chromate type.

D. Protective Backing Paint: Zinc molybdate alkyd.

E. Sealant: Type Silicone specified in Section 07 9005.

F. Plastic Cement: ASTM D 4586, Type I.

2.03 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form pieces in longest possible lengths.

C. Hem exposed edges on underside 1/2 inch; miter and seam corners.

D. Form material with flat lock seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

E. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

F. Fabricate vertical faces with bottom edge formed outward 1/4 inch (6 mm) and hemmed to form drip.

G. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.03 INSTALLATION

A. Conform to drawing details.

B. Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.

C. Apply plastic cement compound between metal flashings and felt flashings.

D. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

E. Seal metal joints watertight.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for field inspection requirements.

B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

3.05 SCHEDULE

A. Through-Wall Flashing in Masonry:
   1. Material: Stainless Steel.

B. Flashings Associated with Shingle Roofing, including Valley, Hip, Ridge, Eave, Gutter Edge, Gable Edge, Chimney:

C. Sheet Metal Roof Expansion Joint Covers, and Roof-to-Wall Joint Covers:

D. Roofing Penetration Flashings, for Pipes, Structural Steel, and Equipment Supports:

END OF SECTION

SECTION 07 6500
SELF-ADHESIVE SHEET BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES:

A. Self-adhesive sheet flashing.

1.02 REFERENCES

A. ASTM E 96/E 96M - Standard Test Method for Water Vapor Transmission of Materials; 2005

1.03 SYSTEM DESCRIPTION

A. Install sheet materials to form a secondary weather barrier to direct water penetrating the exterior skin down and out to the exterior.

B. Extend sheet materials across joints and seams in similar and dissimilar substrates and around doors, windows, and other openings to form a continuous barrier against intrusion of water and air.

1.04 SUBMITTALS

A. Product Data:
   1. For approval: Written technical product information for each type of product to demonstrate products comply with contract documents. Provide all products of this section from one manufacturer.
   2. For information (Project record): Manufacturer's detailed installation instructions. No provision of such instructions shall be deemed to delete any requirement of the Contract Documents without the approval of the Architect issued as a Contract Modification.

B. Reports: Submit reports signed by Contractor, installer, and membrane manufacturer's representative of:
   1. Preapplication review.
   2. Preconstruction inspection.
   3. In-progress inspections.
   4. Completion inspections.

1.05 QUALITY ASSURANCE

A. Preapplication Review: Schedule a meeting before start of installation with installer and waterproofing manufacturer's representative to review procedures for substrate preparation and waterproofing application.
   1. Review contract document requirements, manufacturer's product data, and application instructions.
   2. Manufacturer’s representative shall instruct first-time installers in proper installation procedures, and shall be available throughout project for trouble shooting upon request.

B. Install sheet materials in mock-ups specified elsewhere.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in manufacturer’s original unopened containers.

B. Store containers in a dry location at temperatures under 100°F. Do not double-stack pallets.

C. During cold weather installation (under 60°F), store sheet in heated enclosure (70°F to 90°F) 12 hours prior to installation; Remove only such material as is needed for immediate use.

D. Do not install material when substrate temperature is under 40°F unless special procedures recommended by the manufacturer are followed and successful adhesion is obtained and mock-ups are approved by the Architect.

E. Do not expose to sunlight for more than 30 days, either when in storage or after installation, before covering with subsequent construction.

1.07 SEQUENCING

A. Backing Strip: Ensure that backing strip is installed before installing gypsum sheathing.

PART 2 PRODUCTS

2.01 SUBSTITUTIONS

A. Refer to Section 01 6000 - Product Requirements.

2.02 MANUFACTURERS

A. Provide products of one of the following:
   1. W. R. Grace & Co.
   2. W. R. Meadows Inc.
   3. Henry.
   4. Tremco.

2.03 MATERIALS

A. Self-Adhesive Sheet Flashing:
   1. Composite material: 40 mils nominal thickness.
   2. Release sheet to protect adhesive layer.
   3. Product:
      a. W. R. Grace & Co.; Perm-A-Barrier Wall Flashing.
      b. W. R. Meadows Inc.; Air Shield Self Adhering Air Barrier and Flashing Membrane.
      c. Henry: Blueskin TWF.
      d. Tremco: TWF.

B. Self-Adhesive Joint Seam Tape:
   1. Composite material: 30 mils nominal thickness.
   2. Release sheet to protect adhesive layer.
   3. Product:
      a. W. R. Grace & Co.; Vycor Plus Self-Adhered Flashing.
      b. W. R. Meadows Inc.; Air Shield Self Adhering Air-Barrier and Flashing Membrane.

C. Termination Mastic:
   1. Trowel or caulking grade rubberized asphalt-based mastic.
   2. Products:
      a. W. R. Grace & Co.; Bituthene Mastic.
      b. W. R. Meadows Inc.; Seal Tight Pointing Mastic.
      c. Henry: Air-Bloc 06 Trowel Grade.
      d. Tremco: Dymonic FC.

D. Sealant: Specified in Section 07 9000.

E. Solvent Base Primer:
   1. Rubber-based, solvent dispersed liquid for substrate preparation.
   2. Products:
      a. W. R. Grace & Co.; B2 Low VOC Content Primer.
      b. W. R. Meadows Inc.; Mel Prime Solvent Based Primer.

c. Henry: Blueskin Primer.
d. Tremco: ExoAir 10 Primer.

F. Metal Edge:
1. Stainless steel, Type 304, 0.018" thick, with 2B finish.
2. Size to project beyond face of construction 1/2" (drip edge on a 45 degree angle) and to extend not less than 4 inches nominal across masonry wythe.
3. Provide 3/8" hem on outside edge.

G. Carrier Sheet: Provide where self-adhesive sheet spans the cavity or other gap in construction.
1. Same material as metal edge.

H. Termination Bar: Extruded aluminum or formed stainless steel, pre-punched with slotted holes at 8 inch o.c. for fasteners.
1. Fasteners for bar on stud back-up: For steel studs #12 screws with Type 304 stainless steel head and shaft, carbon steel tip; for wood studs Type 304 stainless steel nails or screws.
2. Fasteners for bar on concrete or masonry back-up: Stainless steel drive pins with lead expansion shields.
3. Backing Strip: Galvanized steel sheet metal, 4 inches wide.

PART 3 - EXECUTION

3.01 BACKING STRIP

A. When cold formed metal framing installation is complete and before installing gypsum sheathing, install backing strip to face of studs in a continuous fashion, directly behind the location where termination bars will be installed.

3.02 EXAMINATION AND PREPARATION

A. Review installed substrate surfaces for compliance with preparation requirements. Document necessary actions for correcting unacceptable surface conditions.

B. Verify that surfaces are smooth, sound, clean, and dry, and that components which will penetrate self-adhesive sheet are complete and rigidly installed.

C. Temperature: Install primer and sheet when temperature of substrate is 40°F or above.

D. Do not install sheet until substrate condition is acceptable to the Contractor, installer, and sheet manufacturer's representative.

E. Concrete Substrates:
1. Verify that form release agents or curing compounds used on surfaces are compatible with sheet products.
2. Where incompatible products have been used, remove in accordance with sheet manufacturer’s instructions.
3. Remove dust and chalk from substrates by dry brushing or pressure washing. Allow surface to dry thoroughly.
4. Remove and repair honeycomb, aggregate pockets, fins, ridges, and projecting rough areas.
5. Apply primer on same day as sheet installation, and allow to dry.

F. Concrete Unit Masonry Substrates:
1. Flush masonry joints on wall face to receive membrane, and parge coat (one part portland cement; three parts sand) or other method of filling voids in concrete block is required.
2. Allow ample time, never less than 1 day, for mortar to harden prior to installing sheet.

3. Remove dust and chalk from substrates by dry brushing or pressure washing. Allow units to dry thoroughly.
4. Apply primer, and allow to dry. On same day as primer installation, install membrane.

G. Sheathing Substrates:
1. Remove dust from substrates by dry brushing.
2. Apply primer and allow to dry.

H. Metal Substrates: Columns, structural beams etc.
1. Ensure that surface is clean and free of dust, oils, or other contaminants.
2. Apply primer, and allow to dry. On same day as primer installation, install membrane.

I. Steel Lintels, Shelf Angles and Masonry to Receive Metal Edge or Sheet Flashing:
1. Ensure 100% solid units have been used or that cores of units have been filled flush with mortar to top of units.
2. Allow ample time, never less than 1 day, for mortar to harden prior to installing sheet.
3. Remove dust and chalk from substrates by dry brushing. Allow units to dry thoroughly.
4. Apply primer, and allow to dry. On same day as primer installation, install membrane.

3.03 INSTALLATION

A. General:
1. Precut pieces of sheet to required size for proper installation and ease of handling.
2. Remove release paper and position sheet against substrate.
3. Press entire surface area of sheet firmly against substrate using 6 inch steel hand roller on flat surfaces, or by burnishing with blunt tool such as back of a utility knife on small areas and corners. Continue operation until entire sheet is well bonded to substrate.
4. Plan installation generally from bottom to top. Overlap adjacent pieces 2 inches, forming laps that shed water, not dam water.
5. Roll or burnish laps to ensure complete adhesion.
6. Apply a bead of mastic on laps and perimeter of sheet.
7. Seal unavoidable penetrations with mastic.
8. Do not contaminate substrates to receive sealant with primers, surface conditioner, or self-adhesive sheet material.
9. Apply mastic on top of sheets, only. Do not apply sheet on top of mastic.

B. Self-Adhesive Sheet Flashing:
1. Whether or not specifically indicated, install flashing at all conditions such as lintels and shelf angles where the downward flow of any water within the wall will be interrupted, so that such water will be diverted to the exterior. Extend flashings full width at such obstructions and onto adjoining construction, and turn up to form watertight pan. Remove or cover protrusions or sharp edges on substrates which could puncture flashings. Seal lapped ends and penetrations of flashing before covering with subsequent materials.
2. Heads and Sills: Turn up ends of flashing at least 2 inches at heads and sills to form a pan, and seal joints.
3. Seal top of flashing with mastic.
4. Where building paper or wall membrane is indicated, lap building paper or wall membrane over flashing to shed water.

C. Metal Edge:
1. In masonry construction install metal drip edge projecting approximately uniformly beyond exposed face.

2. Provide 1/4 inch gap between ends of metal drip edge to allow for expansion and contraction.
3. Set metal drip edge in 2 continuous beads of sealant. If permanent masonry is not placed immediately, weight the metal edge with masonry units until it reaches initial set so as to to fully compress the sealant. Do not disturb metal edge until sealant is well set.
4. Lap self-adhesive flashing on top of metal within mortar joint. Hold membrane back 1/2 to 1 inch from face of masonry.
5. Protect exposed metal edge from bending or other damage.

D. Masonry Through-Wall Flashings: Bring completely through inner wythe and turn up where concealed by other construction; otherwise stop not more than 1/2 inch from inner face. Drop flashing at least 4 inches before bringing through outer wythe.

E. Masonry Veneer Flashings: Turn flashings up not less than 8 inches at backup.

F. Termination Bar: Install termination bar where top of flashings terminate against back-up construction. Secure bar to back-up with mechanical fasteners at 8 inches on center. Seal outside edge with termination mastic.
1. Where termination bars occur over gypsum sheathing, ensure that fasteners penetrate backing strip.

G. Self-Adhesive Joint Seam Tape:
1. At locations indicated on the drawings (generally at interface of wall with doors, windows, and similar construction), install self-adhesive sheet flashing.

H. Windows and Doors:
1. Install self-adhesive sheet flashing in picture frame fashion beginning with the sill, then the jambs, then the head to form a water and air tight barrier.

3.04 FIELD QUALITY CONTROL

A. Inspect installation before covering with subsequent construction.

B. Obtain the Architect's approval of initial installation before proceeding with full-scale production.

3.05 CLEANING AND PROTECTION

A. Protect adjacent surfaces from contamination by surface conditioners, primers, or residue from bituminous sheet.

B. Remove spills, stains, or over-application in accordance with manufacturer's recommendations.

C. Protect installed material from damage. Repair any damage to sheet promptly.

D. If schedule of construction would unavoidably expose sheet materials to sunlight for more than 30 days, cover materials to avoid exposure to sunlight, unless approved in writing by the Architect and the Manufacturers Representative.

END OF SECTION

SECTION 07 7123
GUTTERS AND DOWNSPOUTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Gutters.

B. Downspouts.

C. Downspout boots.

D. Precast concrete splash pads.

1.02 REFERENCES

A. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels; 2002.

B. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2007.

C. ASTM B 209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate Metric; 2007.

D. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association; 2003.

1.03 SUBMITTALS

A. Product Data:
   1. Provide data on prefabricated components.
   2. Provide data on finishes.

B. Shop Drawings: Indicate locations, configurations, jointing methods, fastening methods, locations, and installation details.

C. Samples: Submit two samples, 6 inch long illustrating finish.

1.04 DELIVERY, STORAGE, AND PROTECTION

A. Stack material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope to drain.

B. Prevent contact with materials that could cause discoloration, staining, or damage.

PART 2 PRODUCTS

2.01 SUBSTITUTIONS

A. Refer to Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Aluminum Sheet: ASTM B 209 (ASTM B 209M).
   1. Thickness: 0.050 inch.
   2. Finish: Coil-coated, baked enamel organic finish.
   3. Color: As selected from manufacturer's standard colors.

B. Fasteners:
   1. Stainless steel or aluminum, match finish.

2.03 ACCESSORIES

A. Splash Pads: Precast concrete type, size and profiles indicated; minimum 3000 psi at 28 days, with minimum 5 percent air entrainment.

B. Downspout Boots: Cast iron.

2.04 FABRICATION

A. Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance.

B. Gutters:
1. SMACNA Oogee style as indicated on the drawings.
2. Depth: _____4_____ inches. Width: ___5_____ inches.
3. Form gutters in continuous lengths without transverse seams except at expansion joints and corners.
4. Fabricate expansion joints as shown in SMACNA Figure 1-6 or 1-7.
5. Provide gutter brackets as shown in SMACNA Figure 1-12.
   a. 3/16 x 1 inch.
6. Provide gutter spacers as shown in SMACNA Figure 1-12
7. Rivet seams, end caps, corners, and downspout outlets to form strong, permanent construction.
8. Seal seams watertight.

C. Downspouts:
1. SMACNA Fig. 1-31, corrugated rectangular profile.
2. Shop-fabricated hangers, SMACNA profile as indicated on the drawings.
3. Size: _____4"_____
4. Form bends and offsets as required by project conditions.
5. Crimp and form slip-joints in downspouts, and secure with mechanical fasteners.

2.05 FACTORY FINISHING

A. Baked Enamel Coating: Organic Finish, AAMA 2603; multiple coat, thermally cured fluoropolymer finish system.

B. Primer Coat: Finish concealed side of metal sheets with primer compatible with finish system.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that surfaces are ready to receive work.

3.02 INSTALLATION

A. Install in accordance with SMANCA instructions.

B. Box and Ogee Gutters:
1. Do not fix gutter to building with fasteners other than within 2 feet of the center of the gutter length.
2. Support gutters on brackets spaced at not more than 36 inches o.c. Install spacers at not more than 36 inches o.c. Stagger brackets and spacers 18 inches.

C. Slope gutters to downspouts, as indicated.

D. Connect downspouts to downspout boots.

E. Connect downspout boots to storm sewer system in accordance with requirements in site construction specifications.

F. Set splash pad under each downspout not connected to downspout boots.

END OF SECTION

SECTION 07 7210
ROOF PENETRATION ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flashings for penetrations in roofing membrane.

B. Pipe supports.

1.02 REFERENCES

A. ASTM A 123/A 123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2002.

B. ASTM A 167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip; 1999 (Reapproved 2004).

C. ASTM B 32 - Standard Specification for Solder Metal; 2004.

D. ASTM C 612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2004.

E. AWPA C2 - Lumber, Timber, Bridge Ties and Mine Ties -- Preservative Treatment by Pressure Processes; 2003.

F. FS TT-C-494 - Coating Compound, Bituminous, Solvent Type, Acid Resistant; Revision B, 1985.

G. NRCA ML104 - The NRCA Roofing and Waterproofing Manual; Fifth Edition, with interim updates.

H. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2003.

1.03 SUBMITTALS

A. Product Data:
   1. Provide manufacturer's specifications, standard details, and installation recommendations.
   2. Indicate size and spacing of fasteners.

PART 2 PRODUCTS

2.01 SUBSTITUTIONS

A. Refer to Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Flashings, Counterflashings, and Receivers: Stainless Steel Sheet: ASTM A 167, Type 302 or 304. 28 gage (0.0156 inch; 0.4 mm).

B. Fasteners:
   1. For attachment of roof accessories to supporting structure: Hot-dip galvanized, zinc plated or cadmium plated steel, or stainless steel.
   2. Concealed fasteners for flashings and receivers: Hot-dip galvanized steel or stainless steel.
   3. Exposed fasteners: Stainless steel.

C. Hot-Dip Galvanizing for fabricated products and hardware: ASTM A 123.

D. Solder: ASTM B 32, 50/50 tin-lead, rosin flux unless recommended otherwise by sheet metal manufacturer.

E. Pourable Sealer: 2-part pourable urethane sealant..

F. Bituminous Coating: Heavy bodied, sulfur-free, asphalt-based paint; FS TT-C-494.

G. Insulation: Mineral (Rock or Slag) Fiber Insulation Board; ASTM C 612; composed of thermosetting resin binders and semirefractory mineral fibers derived from slag.

2.03 MANUFACTURED CURBS

A. General: Provide curbs and supports for mechanical equipment and appurtenances.
   1. Fabricate from galvanized steel sheet, minimum 18 gage, with seams fully welded, ground smooth, and painted with zinc-rich primer.
   2. Engineer units to support superimposed gravity and wind uplift loads.
   3. Style: Vertical sides (no cant).
   4. Slope bottom edges to match slope of roof deck so that top is level when installed.
   5. Height of curb to extend not less than 10 inches (254 mm) above roof membrane surface.

B. Pipe Supports: Comply with NRCA Detail MB-20, using manufactured metal curb.
   1. Nailers: Provide Provide 2 inch (51 mm) high nailers on top of curb units, fabricated from softwood lumber preservative-treated by the pressure process in accordance with AWPA C-2.
   2. Custom Flashing Cap: Size flashing cap to project 1 inch (25 mm) beyond face of curb to allow for installation, maintenance, and replacement of base flashings (flashing cap 2 inches (51 mm) longer and 2 inches (51 mm) wider than curb). Flashing Material: Stainless steel.
   3. Provide formed galvanized steel (strut) channel attached to top of flashing cap, fully threaded galvanized steel support rods, pipe roller chair of size to accommodate piping, stainless steel top bracket (retainer), and galvanized steel nuts for securement and adjustment.
   4. Height of support as necessary to comply with Schedule of Vertical Clearances.

2.04 VERTICAL PIPING PENETRATIONS NOT SUBJECT TO MOVEMENT

A. Typical Applications:
   1. Conduit.
   2. Large diameter piping rigidly anchored to concrete roof deck.

B. Flashing: SMACNA Figure 4-16A, or "PD/PS" series by S.B.C. Industries; www.sbcflashings.com. (800-228-2580; 305-893-2036)

C. Flashing Material: Stainless steel.

D. Install wood nailer and around flashing to fully support flashing flange.
   1. Mechanically fasten membrane to nailer in accordance with membrane manufacturer’s recommendations.
   2. Mechanically fasten flashing flange to nailer.
   3. Nailer thickness equal to insulation thickness.

2.05 VERTICAL PIPING PENETRATIONS SUBJECT TO MOVEMENT (VIBRATION, THERMAL EXPANSION/CONTRACTION)

A. Typical penetrations:
   1. Hot and cold water piping.
   2. Chilled water piping.
   3. Steam piping.
   4. Similar penetrations.

B. Provide roof curb.

C. Counterflashing:

1. Single, round penetrations up to 12 inches (305 mm) diameter: SMACNA Figure 4-13A.
2. Multiple, round penetrations up to 12 inches (305 mm) diameter each: SMACNA Figure 4-13B.
3. Maintain not less than 2 inches (51 mm) clear between penetrations.

D. Provide clearance between curb, penetration, and counterflashing to accommodate expected range of movement.

E. Fill void inside of curb with mineral wool insulation to depth of slab plus roofing insulation.

F. Flashing material: Stainless steel.

2.06 OTHER PENETRATIONS AND CONDITIONS

A. At conditions not scheduled or otherwise indicated, provide curbs and flashings in accordance with SMACNA standard details and recommendations, and fabricated of the materials specified herein.

2.07 SCHEDULE OF VERTICAL CLEARANCES

A. Fabricate equipment supports and pipe supports to provide not less than the following distances. W=width of equipment. H=height measured from roof membrane surface to underside of equipment.
1. W less than 25 inches (620 mm): H=14 inches (356 mm).
2. W 25 inches (620 mm) to less than 37 inches (940 mm): H=18 inches (457 mm).
3. W 37 (940 mm) to less than 49 inches (1245 mm): H=24 inches (610 mm).
4. W 49 inches (1245 mm) or greater: H=48 inches (1219 mm).

2.08 FLASHING FABRICATION

A. Shop fabricate flashings, counterflashings, receivers, sleeves, bonnets, and other sheet metal items to the greatest extent practicable.

B. Soldering:
1. Soldered joints are required for all joints except between two-piece receiver and counterflashing. Sealant joints are not acceptable substitutes for soldered joints. Sealant shall be installed between sheet metal fabrications and adjacent construction, not as a means of fabricating sheet metal.
2. Clean surfaces to be soldered, removing oils and foreign matter.
3. Pretin edges of sheets to be soldered to a width of 1-1/2 inches, except where pretinned surface would show in the finished work.
4. Do not use torches for soldering.
5. Heat surfaces to receive solder and flow solder into joint. Fill joint completely.
6. Completely remove flux and spatter from exposed surfaces.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrates and openings are rigidly set, at proper lines and elevation, properly sized, and ready to receive units.

B. Do not proceed with installation until conditions detrimental to proper installation have been corrected.

C. Coordinate installation with roofing work and other adjacent elements of building envelope to ensure watertight construction.

3.02 DISTANCE BETWEEN PENETRATIONS

A. Coordinate and layout mechanical, electrical, and structural work to provide clearance between penetrations as follows:
   1. Distance between curb and adjacent curb: Not less than 20 inches (508 mm).
   2. Distance between curb and adjacent wall or equipment extending more than 36 inches (914 mm) above roof: Not less than 36 inches (914 mm).
   3. Distance between stripped-in roof jacks and adjacent curbs, parapets, or walls: Not less than 18 inches (457 mm).
   4. Distance between stripped-in jacks: Not less than 12 inches (305 mm).

B. If the Contract Documents appear to indicate clearances less than above, obtain instructions from the Architect before proceeding with layout and coordination. Do not construct clearances less than above without the approval of the Architect. If clearances less than above have been constructed without the express approval of the Architect, reconstruct clearances without change in Contract Time or Price.

3.03 INSTALLATION

A. Install products in accordance with manufacturer's instructions, except where more stringent requirements are shown or specified, and except where project conditions require extra precautions or provisions to ensure satisfactory performance of the work.

B. Install products in correct location, plumb and true, without warp or twist.

C. Secure curbs and equipment supports to structure, and equipment to curbs, in accordance with manufacturer's instructions to prevent wind uplift forces specified. Do not install curbs or equipment supports on top of roofing insulation or nailers unless specifically approved.

D. Isolate dissimilar metals by means of a heavy bituminous coating, approved paint coating, adhered polyethylene sheet, or other means approved by the Architect.

3.04 SEALING OF ENVELOPE

A. General: Install sealant to form a water-tight and air-tight seal between penetrating elements and building envelope.

B. Where roof deck is indicated to be a fire-resistance-rated assembly, install firestopping between penetrating elements and deck. Firestopping is specified elsewhere in Division 7.

C. Where roof deck is not indicated to be a fire resistance rated assembly:
   1. Fill void between penetration and deck with mineral wool insulation and install pourable sealant to seal between penetrating element and deck.
   2. Where curbs are not used, install pourable sealant up to top of sheet metal flashing.
   3. Exception: Where prohibited by flue or stack clearance requirements.

3.05 CLEANING AND PROTECTION

A. Touch up marred or abraded areas of finished elements. If satisfactory touch-up cannot be accomplished, remove and replace element.

3.06 SMACNA FIGURES

A. See the SMACNA "Architectural Sheet Metal Manual" for additional material, fabrication, and joining requirements.

END OF SECTION

SECTION 07 9000
JOINT SEALERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Section Includes:
   1. Sealants and joint backing.
   2. Precompressed foam sealers.

B. Work of this section includes:
   1. Sealing of joints is indicated in the schedule at the end of this section and in other locations required by the Contract Document.
   2. Seal joints in exterior envelope to prevent the entry or escape of water or air.
   3. Seal joints on the interior of the building to prevent the passage of water or air from space to space or between adjacent building materials and assemblies.
   4. Joints of a nature similar to that of joints indicated shall be sealed with same sealer, whether or not specifically indicated on the drawings and schedules to be sealed.

1.02 REFERENCES

A. ASTM C 834 - Standard Specification for Latex Sealants; 2005.

B. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants; 2005.

C. ASTM C 1311 - Standard Specification for Solvent Release Sealants; 2002.

D. ASTM C 1193 - Standard Guide for Use of Joint Sealants; 2005a.

1.03 DEFINITIONS

A. M Type Substrates: Cast-in-place concrete, concrete masonry units, clay brick, masonry mortar, natural stone.

B. G Type Substrates: Glass and transparent plastic glazing sheets.

C. A Type Substrates: Metals, porcelain, glazed tile, and smooth plastics.

D. O Type Substrates: Wood, unglazed tile; substrates not included under other categories.

E. Use T: Surfaces bearing pedestrian or vehicular traffic.

F. Use NT: Non-traffic-bearing surfaces.

1.04 SUBMITTALS

A. Product Data:
   1. Provide manufacturer's data on each joint sealer indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, color availability, and installation instructions.

B. Samples: Submit two cured samples for each product exposed to view, illustrating full range of sealant colors available for selection.

C. Test Reports:
   1. Notice of readiness of field samples for testing.

D. Installer's Preconstruction Inspection Report: List all conditions detrimental to performance of joint sealer work.

E. Warranty.

1.05 QUALITY ASSURANCE

A. Field Installation Tests:

1. Before installation, test the adhesion of all sealers to actual substrates. Do initial field adhesion hand-pull tests in the presence of the Architect.
2. Field Test as described in ASTM C 1193 Appendix X1.1 - Method A, Field-Applied Sealant Joint Hand Pull Tab:
   a. Seal at least 5 foot (1.5 m) lengths of joints and cure properly.
   b. Perform each test at the job site after the sealant is fully cured.
   c. Make a knife cut horizontally from one side of the joint to the other.
   d. Make two vertical cuts, from the horizontal cut, approximately 3" (76 mm) long, at both sides of the joint.
   e. Place a 1 inch (25 mm) mark on the sealant tab.
   f. Grasp the 2 inch (51 mm) piece of sealant firmly just beyond the 1inch (25 mm) mark and pull at a 90 degree angle.
   g. If dissimilar substrates are being sealed, check the adhesion of sealant to each substrate separately. This is accomplished by extending the vertical cut along one side of the joint, checking adhesion to the opposite side, and then repeating for the other side.
   h. Pass criteria: When extended to its rated value, sealant remains intact or sealant tears in cohesion. Fail criteria: Before or at extension to its rated value, sealant releases from either substrate.
   i. Inspect the joints for complete fill. The joints should not have voids, and joint dimensions indicated.
   j. Repair the sealant pulled from the test area by applying new sealant to the test area. Care should be taken to ensure that the original sealant surfaces are clean and that the new sealant is in contact with the original sealant.

1.06 MOCK-UP

A. Before beginning installation, install sealers in joints in actual construction as directed by the Architect, to show color, materials, and installation.

B. Locate where directed.

C. Keep mock-ups intact as the standard for evaluating the completed joint sealer work.

D. Mock-up may remain as part of the Work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original containers or bundles with labels showing manufacturer, product name or designation, color, shelf life, and installation instructions.

1.08 PROJECT SITE CONDITIONS

A. Environmental Limitations: Do not install sealers if any of the following conditions exist:
   1. Air or substrate temperature exceeds the range recommended by sealer manufacturer or is below 40 degrees F (4.4 degrees C) or is above 100 degrees F (38 degrees C).
   2. Substrate is wet, damp, or covered with snow, ice, or frost.
   3. Substrate is dusty, oily, or otherwise contaminated.

B. Dimensional Limitations: Do not install sealers if joint dimensions are less than or greater than that recommended by sealer manufacturer; notify the Architect and get joint sealer manufacturer's recommendations for alternative procedures.

C. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.09 WARRANTY

A. Submit a written warranty signed by the Contractor guaranteeing to correct failures in joint sealer work within a five year period after Date of Substantial Completion, without reducing or otherwise limiting any other rights to correction which the Owner may have under the contract documents. Failure is defined as failure to remain weathertight due to faulty materials or workmanship. Correction is limited to replacement of sealers.

PART 2 PRODUCTS

2.01 SUBSTITUTIONS

A. Refer to Section 01 6000 - Product Requirements.

2.02 SEALANTS

A. Precompressed foam sealers: Self-expanding foam impregnated with noncuring sealant resins.
   1. Primary Seal:
      a. Size as required to provide watertight seal when installed.
      b. Products:
         1) Emseal; Colorseal: www.emseal.com.

B. High Movement Silicone Sealant: One- or two-part, non-acid-curing, ASTM C 920, Grade NS, Class 25, Use NT, plus movement capability of 50 percent in extension, 50 percent in compression.
   1. Products:
      a. Dow Corning Corporation; Dow Corning 790 or 795: www.dowcorning.com. (39 g/l), (28 g/l)

C. Mildew-Resistant Silicone Sealant: One-part, ASTM C 920, Type S, Grade NS, Class 25, Use NT, formulated with fungicide, for interior use on nonporous substrates.
   1. Products:
      a. Dow Corning Corporation; Dow Corning 786: www.dowcorning.com. (33 g/l)

D. Butyl Sealant:
   1. ASTM C 1311.
      a. Product: Tremco Butyl Sealant.

E. Concealed Sealant in Contact with Weather-Resistant Membrane (Section 07 2820): One-part non-sag urethane approved by membrane manufacturer for compatibility with membrane, and as follows:
   1. Products:
      a. Bostik; Chem-Calk 900: www.bostik.com. (47.1 g/l)
      b. Sika Corporation; Sikaflex 1a: www.sika.com. (47.6 g/l)
      c. Sonneborn/BASF Building Products; Sonolastic NP 1: www.buildingsystems.basf.com. (43 g/l)

F. Latex Sealants:
   1. Acrylic-Latex Emulsion Sealant: One-part, nonsag, mildew-resistant, paintable; complying with ASTM C 834.
      a. Products:
         1) Bostik; Chem-Calk 600; www.bostik.com. (39 g/l)
         2) Pecora Corporation; AC-20 + Silicone: www.pecora.com. (31 g/l)
         3) Sonneborn/BASF Building Products; Sonolac: www.buildingsystems.basf.com. (41 g/l)

2.03 ACCESSORIES

A. Primer: Nonstaining type, as recommended by joint sealant manufacturer.

B. Joint Cleaner: Noncorrosive and nonstaining type, recommended by sealant manufacturer; not damaging to substrates, and compatible with joint forming materials.

C. Backer Rods: Flexible, nonabsorbent, compressible polyurethane foam, either open cell or nongassing closed cell, unless otherwise restricted by sealant manufacturer; preformed to appropriate size and shape.

D. Bond-Breaker Tape: Self-adhesive, polyethylene or other plastic tape, unless otherwise restricted by sealant manufacturer; suitable for preventing sealant adhesion.

E. Masking Tape: Nonabsorbent, nonstaining.

F. Tooling Agents: Approved by sealant manufacturer; nonstaining to sealant and substrate.

2.04 SEALANT COLORS

A. The Architect will select sealant colors from manufacturer's full range of available colors for each respective sealant and adjacent substrate.

B. Obtain approval of mock-up color before ordering job quantities of sealant.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine joints for characteristics that may affect sealer performance, including configuration and dimensions.

B. Verify that joint backing and release tapes are compatible with sealant.

3.02 PREPARATION

A. Cleaning: Just before starting sealer installation, clean out joints as follows:
   1. Remove loose materials and foreign matter which might impair adhesion of sealant including, but not limited to, dust, dirt, coatings, paint, oil, and grease.
   2. Dry out damp and wet substrates thoroughly.
   3. Clean A-type and G-type substrates by chemical or other methods that will not damage the substrate.
   4. Remove loose particles by brushing and by blowing with oil-free compressed air.
   5. Concrete: Remove laitance and form-release coatings.
   6. Use methods which will not leave residues that will impair adhesion.

B. Prime joint substrates where required by this specification, manufacturer's recommendations, or adhesion tests.

C. Masking Tape: Use masking tape to keep primers and sealers off of adjacent surfaces which would be damaged by contact or by cleanup. Remove tape at the end of each day.

D. Protect elements surrounding the work of this section from damage or disfigurement.

E. Install fillers where needed to provide proper joint depth or support for sealant backers.

F. Do not begin joint sealer work until unsatisfactory conditions have been corrected.

3.03 INSTALLATION

A. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

B. Comply with sealer manufacturer's installation instructions and recommendations, except where more restrictive requirements are specified.

C. Gunnable and Pourable Sealants: Comply with recommendations of ASTM C 1193.

D. Backers:

1. Install backers at depth required to result in shape and depth of installed sealant which allows the most joint movement without failure.
   a. Make backers continuous, without gaps, tears, or punctures.
   b. Do not stretch or twist backers.
2. Use bond-breaker tape wherever it is necessary to keep sealant from adhering to back or third side of joint.
3. If backers become wet or damp before installation of sealant, dry out thoroughly before proceeding.

E. Shape and Depth: Use methods recommended by manufacturer; completely fill the joint; make full contact with bond surfaces; tool nonsag sealants to smooth surface eliminating air pockets.
1. Use concave joint shape shown in Figure 8 in ASTM C 1193, where not otherwise indicated.
2. Depth of sealant at center of joint, unless otherwise required by the Contract Documents or recommended by manufacturer:
   a. For joints up to 1/4 inch (6.4 mm) wide: Depth equal to width.
   b. For joints 1/4 inch to 1/2 inch (13 mm) wide: Depth equal to 1/4 inch.
   c. For joints over 1/2 inch (13 mm) wide: Depth equal to 1/2 the width but not deeper than 1/2 inch.
3. Contact depth: Twice the depth of sealant at center of joint, unless otherwise required.

F. Precompressed Foam Sealers:
1. Install precompressed foam sealers in compressed state.
2. Unwind foam joint sealant along joint to be sealed, remove release liner to expose adhesive side, and press foam joint sealant adhesive against side of joint with hand or putty knife to ensure bond to substrate.
3. Install foam joint sealant from the bottom up, and keep face of foam joint sealant in consistent alignment with face of adjacent materials.
4. Press adhesive side firmly against one side of full length of joint. Foam joint sealant will expand to fill joint.
5. Join end-to-end joints of lengths of materials less than 2-3/4 inch (70 mm) wide by mitering across the direction of the expansion of the material.
6. Join end-to end joints of lengths of materials 2-3/4 inch (70 mm) wide and greater by butting.

3.04 CLEANING

A. Clean adjacent soiled surfaces adjacent to joints as work progresses and before sealants set using methods and materials approved by manufacturers of sealers and of surfaces to be cleaned.

3.05 PROTECTION OF FINISHED WORK

A. Protect sealants from contamination and damage until cured.

B. Remove and replace damaged sealers.

3.06 SCHEDULE

A. General:
1. Seal joints in exterior envelope to prevent the entry or escape of water or air.
2. Seal joints on the interior of the building to prevent the passage of water or air from space to space or between adjacent building materials and assemblies.
3. Joints of a nature similar to that of joints indicated shall be sealed with same sealer, whether specifically indicated on the drawings and schedules to be sealed or not.

B. Typical Exterior Joints:
   1. Including, but not limited to:
      a. Wall joints.
      b. Joints around perimeter of frames.
      c. Joints around pipes, ducts, and conduit penetrating exterior walls.
      d. Joints in wash surfaces of precast concrete, cast stone, cut stone, or concrete or brick masonry.
      e. Joints between new and existing walls.
      f. Exterior joints for which no other sealer is indicated.
   2. Use high movement silicone sealant unless otherwise indicated.

C. Precompressed Foam Sealer:
   1. Primary:
      a. After installing precompressed foam sealer, install a fillet of gunnable silicone sealant to joint facer with substrate.

D. Sealant in contact with Weather-Resistant Membrane (Tyvek) - Section 07 2820, concealed from view and concealed from exposure to UV light:
   1. One-part urethane listed for this use.

E. Metal Flashings:
   1. Including, but not limited to:
      a. Joints in flashing, gravel stops, fascia, and coping and between them and adjacent construction.
      b. Where flashing is inserted into reglet in wall, and top edge of surface mounted reglets.
   2. Use high movement silicone sealant.

F. Exterior Door Thresholds: Set thresholds in butyl sealant.

G. Typical Interior Joints:
   1. Including, but not limited to:
      a. Between walls or partitions and adjacent casework, laboratory furniture, fixed shelving, fixed equipment, lighting fixtures, laboratory piped utility fittings.
      b. Interior joints for which no other sealer is indicated.
   2. Use the following sealant:
      a. Acrylic-emulsion latex sealant.

H. Joints in Interior Wet Areas:
   1. Including, but not limited to:
      a. Bathrooms.
      b. Between walls or other surfaces and adjacent plumbing fixtures, fittings, and casework.
   2. Use the following sealants:
      a. Mildew-resistant silicone sealant.

END OF SECTION

SECTION 08 1100
STEEL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Work Included in this Section:
   1. Steel Doors:
      a. Non-fire-resistance rated exterior steel doors.
   2. Steel Frames:
      a. Non-fire-resistance rated interior steel frames.
      b. Non-fire-resistance rated exterior steel frames.

1.02 REFERENCES

A. ANSI A250.8 - SDI-100 Recommended Specifications for Standard Steel Doors and Frames; 2003.

B. ANSI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 1998 (R2004).

C. DHI A115 Series - Specifications for Steel Doors and Frame Preparation for Hardware; Door and Hardware Institute; current edition (ANSI/DHI A115 Series).

1.03 SUBMITTALS

A. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes.

B. Shop Drawings: Details of each opening showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.

1.04 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.05 DELIVERY, STORAGE, AND PROTECTION

A. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

PART 2 PRODUCTS

2.01 SUBSTITUTIONS

A. Refer to Section 01600 - Product Requirements.

2.02 GENERAL

A. Requirements for All Units:
   1. Door Top Closures: Flush with top of faces and edges.
   2. Door Edge Profile: Beveled on both edges.
   3. Door Texture: Smooth faces.

B. Hardware Preparation: In accordance with DHI A115 Series, with reinforcement welded in place, in addition to other requirements specified in door grade standard.

C. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with all the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 STEEL DOORS

A. Exterior Doors, Non-Fire-Rated:
   1. Grade: ANSI A250.8 Level 2, 18 ga., physical performance Level B, Model 1, full flush.
   2. Top Closures: Flush with top of faces and edges.
   3. Galvanized.
   4. Texture: Smooth faces.
   5. Weatherstripping: Integral, recessed into door edge or frame.

2.04 STEEL FRAMES

A. General:
   1. Comply with the requirements of grade specified for corresponding door.
   2. Finish: Same as for door.

B. Exterior Door Frames: Fully welded.
   1. Weatherstripping: Separate, see Door Hardware section.

C. Interior Door Frames, Non-Fire-Rated:
   1. Gypsum board partitions. Drywall slip-on.

2.05 ACCESSORY MATERIALS

A. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.

B. Temporary Frame Spreaders: Provide for all factory- or shop-assembled frames.

2.06 FINISH MATERIALS

A. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A 653/A 653M, with A60/ZF180 coating. Factory-prime galvanized units.
   1. Galvanize exterior units.

B. Primer: Rust-inhibiting, complying with ANSI A250.10 , door manufacturer's standard.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

3.02 INSTALLATION

A. Install in accordance with the requirements of the specified door grade standard.

B. Coordinate frame anchor placement with wall construction.

C. Coordinate installation of hardware.

3.03 ERECTION TOLERANCES

A. Maximum Diagonal Distortion: 1/16 in measured with straight edge, corner to corner.

3.04 ADJUSTING

A. Adjust for smooth and balanced door movement.

END OF SECTION

SECTION 08 1416
FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Factory finishing.
   2. Prefitting by manufacturer.
   3. Premachining by manufacturer.

1.02 REFERENCES

A. Architectural Woodwork Quality Standards; Architectural Woodwork Institute (AWI), 8th Edition Version 2.0; 2005.

B. WDMA (HOW)-- How to Store, Handle, Finish, Install, and Maintain Wood Doors; Wood Flush Doors; National Wood Window and Door Association; 2004.

C. WDMA I.S. 1A -- Architectural Wood Flush Doors; National Wood Window and Door Association; 2004.

1.03 SUBMITTALS

A. Product Data: Submit detailed technical information for each distinct product specified in this section. Include complete data for factory finished doors.

B. Shop Drawings: Prepare and submit shop drawings showing relevant information, including:
   1. Construction details for each distinct product type.
   2. Dimensions and location of blocking for hardware.
   3. Factory finishing details.

C. Samples: Submit samples for the following:
   1. Factory finishes:

D. Certificates:
   1. Submit certification that manufacturer's construction standards and tested fire door assembly requirements comply with contract requirements indicated for doors, hardware, hardware templating, size of lights, and other design characteristics.
      a. Clearly note any exceptions to certification, citing door number and hardware set. Exceptions shall be subject to the approval of the Architect.

1.04 QUALITY ASSURANCE

A. Manufacturer: Member of AWI Quality Certification Program (QCP).

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products as required to prevent damage or deterioration. Conform to manufacturer's recommendations, requirements of referenced standard, and recommendations of WDMA I.S.1A, Appendix, "How to Store, Handle, Finish, Install, and Maintain Wood Doors."

B. Clearly label each door with opening number where door will be installed. Use removable, temporary labels or mark on door surface which will be concealed from view after installation.
   1. Coordinate door identification with shop drawing designations.

C. Environmental Requirements: Do not deliver, store, or install products of this section before building's design temperature and humidity levels have been achieved and will be maintained at those levels.

1.06 WARRANTIES

A. Manufacturer's Warranty (Interior Doors):
   1. Submit a written warranty signed by the manufacturer guaranteeing to correct failures in products which occur within the warranty period indicated below, without reducing or otherwise limiting any other rights to correction which the Owner may have under the contract documents. Failures are defined to include:
      a. Faulty workmanship.
      b. Delamination.
      c. Stile, rail, or core show-through (telegraphing) visible to the naked eye to any degree when viewed from a horizontal distance of 3 to 4 feet.
      d. Warp (including bow, cup, and twist) in excess of 1/4 inch when measured in accordance with WDMA I.S. 1A.
   2. Correction includes repair or replacement at the option of the Architect. Correct failures which occur within the following warranty periods after Substantial Completion:
      a. Solid core interior doors: Life of original installation.

B. If, for any reason, the Contractor's work results in nullification of manufacturer's warranty, the Contractor shall correct failures and pay for such correction.

PART 2 PRODUCTS

2.01 SUBSTITUTIONS

A. Refer to Section 01 6000 - Product Requirements.

2.02 WOOD DOORS - GENERAL REQUIREMENTS

A. Flush Doors: Conform to the following, hereinafter referred to as referenced standard(s):
   1. "Architectural Woodwork Quality Standards" including Section 1300, "Architectural Flush Doors".
      a. Where the AWI standard indicates requirements that conflict with WDMA standards, comply with AWI.

2.03 CONSTRUCTION

A. Grade: Custom.

B. Faces:
   1. Veneer species, cut, and grade for transparent finish (NWWDA, AWI, HPVA standards):
      a. Cherry, Plain Sliced, Grade A.
   2. Veneer matching for transparent finish:
      a. Between adjacent veneer leaves: Book Match.
      b. Within panel face: Running match.
   3. Surface for opaque finish: Medium density overlay (MDO) over hardwood veneer.

C. Construction: PC-5 (5-ply).

D. Core, Non-Fire-Rated Doors: Particleboard, bonded to stiles and rails, sanded.

E. Glue: Type I at exterior doors and at interior doors subject to wetness or humidity such as at toilets, kitchens, showers, etc. Type I or II at other interior doors.

2.04 FABRICATION

A. General:
   1. Fabricate to provide consistent clearances as indicated.
   2. Hinge and lock edges:

a. Provide 1/8-inch standard bevel at edges, unless standard bevel would not precisely match hardware bevel; provide proper bevel for hardware.

3. Make neat mortises and cutouts for door hardware indicated.
4. Prefitting: Fabricate and trim doors to size at factory to coordinate with frame shop drawings and floor finishes as indicated in the finish schedule.
   a. Provide non-standard clearances and tolerances indicated in Part 3.
5. Premachining: Make all mortises and cutouts required for hardware at the factory to conform to approved hardware schedule, hardware templates, and door frame shop drawings.

2.05 FACTORY FINISHING

A. Comply with AWI Section 1500, "Factory Finishing".

B. Transparent Finish:
   1. Type: TR-6, Catalyzed Polyurethane.
      a. Sheen: Satin.
   2. Staining: Match the Architect's sample.
   3. Grade: Custom.

PART 3 EXECUTION

3.01 EXAMINATION

A. Inspect door frames and doors before beginning door installation.
   1. Verify that frames are properly installed and aligned and are capable of providing trouble free support for doors throughout range of door swing.

B. Correct unsatisfactory conditions before installing products of this section. Commencement of installation indicates acceptance of conditions.

3.02 INSTALLATION

A. Hardware Installation: Elsewhere in Division 8.

B. Install doors in accordance with manufacturer's recommended procedures and requirements of referenced standard.

C. Prefit Doors: Minimize field fitting to those procedures which are necessary to complete work unfinished during factory prefitting and to provide trouble free operation.
   1. Accurately align and fit doors for trouble free operation throughout range of door swing.

D. Prefitting Clearances:
   1. Door edge and head: 1/8 inch.
   2. Door edge and jamb: 1/8 inch.
   3. Door bottom edge and top surface of threshold: 1/4 inch.
   4. Door bottom edge and floor covering surface or finish (where threshold is not indicated): 1/8 inch.
   5. Meeting edges at pairs of doors: 1/8 inch total.

E. Installation Clearances: Install doors so as to maintain prefitting clearances specified.

F. Factory-Finished Doors: Before installing doors, restore finish at door edges cut during field fitting.

3.03 ADJUSTING

A. Adjust doors for proper operation; coordinate with hardware adjustment; replace doors that cannot be properly adjusted.

B. Where door finishes are damaged during installation, restore in a manner that results in the door showing no evidence of the restoration. If refinished door cannot be made to match other doors, remove refinished door and replace with new conforming work at the Contractor's expense.

C. Protect installed work.

END OF SECTION

SECTION 08 1433
STILE AND RAIL WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum Clad Wood doors, stile and rail design.

B. Panels of glass.

1.02 RELATED REQUIREMENTS

A. Section 06 2000 - Finish Carpentry: Wood door frames.

B. Section 08 7100 - Door Hardware.

C. Section 08 8000 - Glazing.

1.03 REFERENCE STANDARDS

A. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; American Architectural Manufacturers Association; 1998.

B. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels; 2002.

C. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels; 2005.

D. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2005.

E. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; American Architectural Manufacturers Association; 2004.

F. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2007.

G. ASTM B 209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate Metric; 2007.

H. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2006.

I. ASTM B 221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes Metric; 2006.

J. ASTM E 283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004.

K. ASTM E 330 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2002.

L. ASTM E 331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Indicate stile and rail core materials and construction; veneer species, type and characteristics.

C. Specimen warranty.

D. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required , special beveling , special blocking for hardware , factory machining criteria , factory finishing criteria.

E. Manufacturer's Installation Instructions: Indicate special installation instructions.

F. Warranty, executed in Owner's name.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver, and store doors in accordance with quality standard specified.

B. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, telegraphing core construction, and _____.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Exterior Patio Doors:
1. Jeld-WEN
2. Marvin Window and Door Company
3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Each unit shall be labeled with a certificate attesting to compliance with AAMA/WDMA/CSA 101/I.S.2/A440, NFRC 100, and other applicable standards for the performance levels specified below.

B. Comply with AAMA/WDMA/CSA 101/I.S.2/A440 Class LC, with the additional requirements specified below.

C. Design windows and size components to withstand the following load requirements, when tested in accordance with ASTM E 330 using test loads equal to 1.5 times the design wind loads with 10 second duration of maximum load:
1. Positive Design Wind Load: 35 lbf/sq ft.
2. Negative Design Wind Load: 35 lbf/sq ft.
3. Member Deflection: Limit member deflection to 1/175 in any direction, with full recovery of glazing materials.

D. Thermal U-factor of window unit, including glazing and framing, determined per NFRC 100: 0.29.

E. Maximum SHGC of fenestration: 0.22.

F. Condensation Resistance Factor: CRF of 54 when measured in accordance with AAMA 1503.1.

G. Air Infiltration: Limit air infiltration through assembly to 0.1 cu ft/min/sq ft of window unit, measured at a reference differential pressure across assembly of 35 psf as measured in accordance with ASTM E 283.

H. Water Leakage: None, when measured in accordance with ASTM E 331 with a test pressure difference of 7.5 lbf/sq ft.

2.03 DOORS

A. Quality Level: Premium Grade, in accordance with AWI/AWMAC/WI Architectural Woodwork Standards.

B. Exterior Doors: 1-3/4 inches thick unless otherwise indicated; solid lumber construction; mortised and tenoned joints.

C. Interior Doors: 1-3/4 inches thick unless otherwise indicated; solid lumber construction; mortised and tenoned joints.

2.04 DOOR FACINGS

A. Exterior Doors: 1 3/4 inches thick Aluminum Clad Wood

B. Interior Doors: Wood veneer, Cherry species, plain sliced, with book matched grain, for transparent finish.

C. Adhesive: Type I - waterproof.

2.05 DOOR CONSTRUCTION

A. At exterior doors, provide aluminum flashing at the top and bottom rail for full thickness and width of door.

B. Factory fit doors for frame opening dimensions identified on shop drawings.

C. Cut and configure exterior door edge to receive recessed weatherstripping devices. Provide edge clearances in accordance with AWI 1600.

2.06 FACTORY FINISHING

A. Finish work in accordance with AWI/AWMAC/WI Architectural Woodwork Standards, Section 5 - Finishing for Grade specified and as follows:
   1. Transparent:
      a. System - 1, Lacquer, Nitrocellulose.
      b. Stain: As selected by Architect.
      c. Sheen: Flat.

B. Exterior Doors:
   1. Exterior Surfaces: Aluminum clad, factory-applied organic finish.

C. Aluminum Finish:
   1. High Performance Organic Finish: AAMA 2604; multiple coats, thermally cured fluoropolymer system.

D. Color: Color as selected from manufacturer's standard colors.

E. Exposed Hardware: Enameled to color as selected from manufacturer's standards.

2.07 MATERIALS

A. Extruded Aluminum: ASTM B 221 (ASTM B 221M), 6063 alloy, T6 temper.

B. Sheet Aluminum: ASTM B 209 (ASTM B 209M), 5005 alloy, H12 or H14 temper.

C. Wood: Clear pine, clear preservative treated in accordance with WDMA I.S.4 using treatment type suitable for transparent or opaque finish.

2.08 GLAZING

A. General Requirements:
   1. Comply with ASTM E 2190, Class CBA.
   2. Purge interpane space and fill with argon gas, hermetically sealed.

B. Provide tempered glass.

C. Clear Insulating Low-E Glass Units: Double pane with glass to elastomer edge seal.
   1. Outer pane of clear glass, inner pane of clear glass.
   2. Low-E Coating: Place low-e coating on No. 2 surface within the unit.
   3. IGU thickness: 5/8 inch.

D. Edge Seal Construction: Aluminum, bent and soldered corners.

E. Glazing: Monolithic (single pane), clear, transparent glass.

F. Simulated Muntins:
   1. Interior: Removable, snap-in type.
   2. Sealed within insulated glass unit.
   3. 1 3/8" extruded aluminum muntins permanently applied to the exterior of the insulating glass unit

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out of tolerance for size or alignment.

3.02 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and AWI/AWMAC Quality Standards requirements.

B. Trim door width by cutting equally on both jamb edges.

C. Trim door height by cutting bottom edges to a maximum of 3/4 inch.

D. Machine cut for hardware.

E. Coordinate installation of doors with installation of frames and hardware.

F. Coordinate installation of glazing.

3.03 TOLERANCES

A. Conform to specified quality standard for fit, clearance, and joinery tolerances.

3.04 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

3.05 SCHEDULE - SEE DRAWINGS

END OF SECTION

SECTION 08 5000
WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Factory-assembled, factory-glazed windows.

B. Insect screens.

C. Trim.

1.02 REFERENCES

A. AAMA/WDMA/CSA 101/I.S.2/A440 - Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors; American Architectural Manufacturers Association; 2005.

B. AAMA 501.2 - Field Check of Metal Storefronts, Curtain Walls, and Sloped Glazing Systems for Water Leakage; American Architectural Manufacturers Association; 2003 (part of AAMA 501).

C. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; American Architectural Manufacturers Association; 1998.

D. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2005.

E. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2007.

F. ASTM B 209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate Metric; 2007.

G. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2006.

H. ASTM B 221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes Metric; 2006.

I. ASTM E 283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004.

J. ASTM E 330 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2002.

K. ASTM E 331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000.

L. ASTM E 2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2002.

M. NFRC 100 - Procedures for Determining Fenestration Product U-factors; 2004, with 2005 addendum.

N. WDMA I.S.4 - Water-Repellent Preservative Non-Pressure Treatment for Millwork; National Wood Window and Door Association; 2007a.

1.03 SUBMITTALS

A. Initial Product Information:

1. Product Data: Provide manufacturer's product data demonstrating compliance with the Contract Documents. Illustrate construction of units and internal drainage details.
2. Samples: Submit one full unit 24 x 36 inches in size. Include:
   a. Frame section.
   b. Operating sash.
   c. Mullion section.
   d. Insect screen and frame.
   e. Factory finishes.
   f. Glass and glazing materials.
   g. Trim.
3. Manufacturer's Installation Instructions: Include complete preparation, installation, joining, sealing, and cleaning requirements.
4. Certificates: Submit independent testing laboratory certification of compliance with AMMA, NFRC, ASTM, and other specified performance criteria.

B. Shop Drawings:
1. Indicate opening dimensions, elevations for different types, framed opening tolerances, method for achieving air and vapor barrier seal to adjacent construction, anchorage locations, and requirements for coordinating sealing to and anchoring to adjacent construction.
2. Show required trim.

C. In-Progress Reports:
1. Field test reports.

D. Closeout Submittals:
1. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Mock-Up:
1. Before beginning the installation of windows, construct a mock-up as specified in Section 01 4300 - Exterior Wall Mock-up.
2. Scheduling:
   a. Provide notice to the Architect of the anticipated starting and ending times and dates when each material included in the mock-up will be constructed, so that the Architect may observe the installation of such materials prior to covering with subsequent materials.
   b. Schedule construction of the entire mock-up to occur over a time period acceptable to the Architect.

1.05 DELIVERY, STORAGE, AND PROTECTION

A. Protect finished surfaces with wrapping paper or strippable coating during installation. Do not use adhesive papers or sprayed coatings that bond to substrate when exposed to sunlight or weather.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Do not install sealants when ambient temperature is less than 40 degrees F and when temperatures are expected to drop below point during the curing period specified by the sealant manufacturer.

1.07 WARRANTY

A. Manufacturer's Warranty.
   1. Correct defective Work within a five year period after Date of Substantial Completion.
   2. Provide 20 year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.
   3. Provide 20 year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.
   4. Include coverage for: Delamination or separation of finish cladding from window member.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Jeld-WEN ; Product Custom Aluminum Clad Wood Casement Window.

B. Marvin Windows and Doors; Product Ultimate Aluminum Clad Wood Casement Window.

C. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Each unit shall be labeled with a certificate attesting to compliance with AAMA/WDMA/CSA 101/I.S.2/A440, NFRC 100, and other applicable standards for the performance levels specified below.

B. Comply with AAMA/WDMA/CSA 101/I.S.2/A440 Class LC, with the additional requirements specified below.

C. Design windows and size components to withstand the following load requirements, when tested in accordance with ASTM E 330 using test loads equal to 1.5 times the design wind loads with 10 second duration of maximum load:
   1. Positive Design Wind Load: 35 lbf/sq ft.
   2. Negative Design Wind Load: 35 lbf/sq ft.
   3. Member Deflection: Limit member deflection to 1/175 in any direction, with full recovery of glazing materials.

D. Thermal U-factor of window unit, including glazing and framing, determined per NFRC 100: 0.29.

E. Maximum SHGC of fenestration: 0.22.

F. Condensation Resistance Factor: CRF of 54 when measured in accordance with AAMA 1503.1.

G. Air Infiltration: Limit air infiltration through assembly to 0.1 cu ft/min/sq ft of window unit, measured at a reference differential pressure across assembly of 35 psf as measured in accordance with ASTM E 283.

H. Water Leakage: None, when measured in accordance with ASTM E 331 with a test pressure difference of 7.5 lbf/sq ft.

2.03 DESIGN REQUIREMENTS

A. Movement: Accommodate movement between window and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.

B. Air and Vapor Seal: Maintain continuous air and vapor barrier throughout assembly, primarily in line with inside pane of glass and inner sheet of infill panel and heel bead of glazing compound.

C. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glass and heel bead of glazing compound.

D. Vapor Seal: No vapor seal failure at interior static pressure of 1 inch, 72 degrees F, and 40 percent relative humidity.

E. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, or migrating moisture occurring within system.

2.04 WINDOWS

A. Profiles: Head, jamb, sill, and stool profile as indicated on the drawings.

B. Aluminum frame and sash; factory fabricated and assembled, factory glazed, and factory finished.

C. Wood frame and sash; factory fabricated and assembled, and factory glazed..

D. Configuration:
1. Fixed, non-operable sash.
2. Outward opening casement with pantograph hardware and operator (American style casement).

E. Simulated Muntins:
1. Interior: Removable, snap-in type.
2. Sealed within insulated glass unit.
3. 1 3/8" extruded aluminum muntins permanently applied to the exterior of the insulating glass unit

F. Built-Up Units: Where multiple-opening-units are shown (side-by-side or over and under) without intervening framing members, provide manufacturer's standard anchors, seals, and trim for joining of units.

2.05 GLAZING

A. General Requirements:
1. Comply with ASTM E 2190, Class CBA.
2. Purge interpane space with dry air, hermetically sealed.

B. Clear Insulating Low-E Glass Units: Double pane with glass to elastomer edge seal.
1. Outer pane of clear glass, inner pane of clear glass.
2. Low-E Coating: Place low-e coating on No. 2 surface within the unit.
3. IGU thickness: 5/8 inch.

C. Edge Seal Construction: Aluminum, bent and soldered corners.

2.06 ACCESSORIES

A. Provide trim and profiles as shown and as necessary for a complete installation.

B. Provide all related flashings, and anchorage, and attachment devices.

C. Fasteners: Non-corrosive.

D. Provide weather-stop nailing flange/fin.

E. Operable Sash Weather Stripping: Permanently resilient, profiled to effect weather seal.

F. Insect Screens: Removable and re-installable from inside.
1. Frame: Manufacturer's standard metal frame, finished to match adjacent window frame; fit with hardware to lock screens in place.
2. Screens: Manufacturer's standard woven metallic, plastic, or fiberglass mesh.

2.07 MATERIALS

A. Extruded Aluminum: ASTM B 221 (ASTM B 221M), 6063 alloy, T6 temper.

B. Sheet Aluminum: ASTM B 209 (ASTM B 209M), 5005 alloy, H12 or H14 temper.

C. Wood: Clear pine, clear preservative treated in accordance with WDMA I.S.4 using treatment type suitable for transparent or opaque finish.

2.08 FABRICATION

A. Fabricate components with smallest possible clearances and shim spacing around perimeter of assembly that will enable window installation and dynamic movement of perimeter seal.

B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.

C. Prepare components to receive anchor devices.

D. Arrange fasteners and attachments to ensure concealment from view.

E. Provide internal drainage of glazing spaces to exterior through weep holes.

F. Factory glaze window units.

G. Fabricate frame and sash members with mortise and tenon joints. Glue and steel pin joints to hairline fit, weather tight.

H. Fabricate framing, mullions and sash members with fusion welded corners and joints, in a rigid jig. Supplement frame sections with internal reinforcement where required for structural rigidity.

I. Form sills and stools in one piece. Slope sills for wash.

2.09 FINISHES

A. Wood frame and sash:
   1. Exterior Surfaces: Aluminum clad, factory-applied organic finish.
   2. Interior Surfaces: Factory primed for field-painted finish specified in Division 9.

B. Aluminum Finish:
   1. Superior Performance Organic Coating System: AAMA 2605 multiple coat, thermally cured polyvinylidene fluoride system .

C. Color: Color as selected from manufacturer's standard colors.

D. Exposed Hardware: Enameled to color as selected from manufacturer's standards.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall openings and adjoining air and vapor seal materials are ready to receive windows.

3.02 INSTALLATION

A. Install windows in accordance with manufacturer's instructions.

B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.

C. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.

D. Provide thermal isolation where components penetrate or disrupt building insulation. Fill shim spaces at perimeter of assembly with insulation so as to maintain continuity of thermal barrier.

E. Coordinate attachment and seal of perimeter air barrier and vapor retarder materials.

F. Install operating hardware not pre-installed by manufacturer.

3.03 ERECTION TOLERANCES

A. Maximum Variation from Level or Plumb: Not more than 1/16 inches every 3 ft non-cumulative nor more than 1/8 inches per 10 ft.

3.04 FIELD QUALITY CONTROL

A. HOSE TEST
   1. Test the window unit in accordance with AAMA 501.2; test both the window unit and the seal between the window and the adjacent weather barrier (such as dampproofing on masonry, weather barrier on sheathing, etc.). Perform testing prior to installation of cladding (such as brick, siding, panels, etc.).

B. Frequency:
   1. Test windows installed on the building at the following frequency:
   2. Test 5 percent of installed windows.
   3. If any window fails, test additional windows at Contractor's expense.

C. Replace windows that have failed field testing and retest until performance is satisfactory.

D. Rework seals that have failed around windows and retest until performance is satisfactory.

3.05 PROTECTION

A. Do not allow caustic or acidic materials such as cement, lime, mortar, or chemicals (or other agents that would stain or marr) to contact frame or glass surfaces.

3.06 ADJUSTING AND CLEANING

A. Adjust hardware for smooth operation and secure weathertight closure.

B. Remove protective material from factory finished surfaces.

C. Wash surfaces by method recommended and acceptable to window manufacturer; rinse and wipe surfaces clean.

D. Remove excess sealant by moderate use of solvent acceptable to window manufacturer.

E. Remove exposed labels only after the approval of the Architect and prior to final completion of the Project. At final completion of the project, glass shall be clean and polished inside and outside, without visible dirt, dust, or staining of any kind.

END OF SECTION

SECTION 08 9100
LOUVERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Louvers, frames, and accessories.

1.02 REFERENCE STANDARDS

A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels; 2005.

B. AMCA 511 - Certified Ratings Program for Air Control Devices; Air Movement and Control Association International, Inc.; 2007.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data describing design characteristics, maximum recommended air velocity, design free area, materials and finishes.

C. Shop Drawings: Indicate louver layout plan and elevations, opening and clearance dimensions, tolerances; head, jamb and sill details; blade configuration, screens, blankout areas required, and frames.

D. Samples: Submit two samples 2 by 2 inches in size illustrating finish and color of exterior and interior surfaces.

E. Test Reports: Independent agency reports showing compliance with specified performance criteria.

1.04 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide twenty year manufacturer warranty against distortion, metal degradation, and failure of connections.
   1. Finish: Include coverage against degradation of exterior finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wall Louvers:
   1. Airolite Company, LLC: www.airolite.com.
   2. American Warming and Ventilating: www.awv.com.
   3. Construction Specialties, Inc: www.c-sgroup.com.
   4. PCI Industries, Inc; All-Lite Brand: www.alllite-louvers.com.
   5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 LOUVERS

A. Louvers: Factory fabricated and assembled, complete with frame, mullions, and accessories; AMCA Certified under AMCA 511.
   1. Screens: Provide insect screens at intake louvers and bird screens at exhaust louvers.

B. Stationary Louvers: Horizontal blade, extruded aluminum construction, with intermediate mullions matching frame.
   1. Free Area: 50 percent, minimum.
   2. Blades: Straight.

3. Frame: 4 inches deep, channel profile; corner joints mitered and , with continuous recessed caulking channel each side.
4. Metal Thickness: Frame 0.081 inch; blades 0.081 inch.
5. Finish: Fluoropolymer coating, finished after fabrication.
6. Color: As selected from manufacturer's standard colors.

2.03 MATERIALS

A. Extruded Aluminum: ASTM B 221 (ASTM B 221M),.

B. Bird Screen: Interwoven wire mesh of steel, 0.063 inch diameter wire, 1/2 inch open weave, diagonal design.

C. Insect Screen: 18 x 16 size aluminum mesh.

D. Polyvinylidene Fluoride Coating: Minimum 70 percent Kynar 500/Hylar 500 resin, two coat finish, complying with AAMA 2604.

2.04 ACCESSORIES

A. Screens: Frame of same material as louver, with reinforced corners; removable, screw attached; installed on inside face of louver frame.

B. Fasteners and Anchors: Galvanized steel.

C. Head and Sill Flashings: See Section 07 6200.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared openings and flashings are ready to receive work and opening dimensions are as indicated on shop drawings.

B. Verify that field measurements are as indicated.

3.02 INSTALLATION

A. Install louver assembly in accordance with manufacturer's instructions.

B. Coordinate with installation of flashings by others.

C. Install louvers level and plumb.

D. Align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.

E. Secure louver frames in openings with concealed fasteners.

F. Install perimeter sealant and backing rod in accordance with Section 07 9005.

G. Coordinate with installation of mechanical ductwork.

3.03 CLEANING

A. Strip protective finish coverings.

B. Clean surfaces and components.

END OF SECTION

062000- Finished Carpentry	Manufacturer & Product	Product	Species	Finish	Remarks
062000.WT1- Wood Trim 1	TBD	1" x 4" stock	Finger joint Paint Grade	Paint	
062000.WT2- Wood Trim 2	TBD	1" x 6" stock	Finger joint Paint Grade	Paint	
062000.WT3- Wood Trim 3	TBD	1" x 7" stock	Finger joint Paint Grade	Paint	
062000.WT4- Wood Trim 4	TBD	1" x 8" stock	Finger joint Paint Grade	Paint	
062000.WT5- Wood Trim 5	TBD	1" x 10" stock	Finger joint Paint Grade	Paint	
062000.WT6- Wood Trim 6	TBD	1" x ease stock Cap	Finger joint Paint Grade	Paint	variable depth, reference sections and details
093000 - Tile	**Manuf.**	**Product Name & Number**	**Color**	**Size**	**Remarks**
093000T1 Tile 1	DalTile	Rittenhouse Square Harlequin	White K101	3" x 6"	Wall Tile with 2" x 6" top cap
093000.T2 Tile 2	DalTile	Rittenhouse Square Harlequin	TBD	3" x 6"	Wall Tile Accent 20%
093000.T3 Tile 3	DalTile	Rittenhouse Square Harlequin	TBD	3" x 6"	Wall Tile Accent 20%
093000.T4 Tile 4	DalTile	Rittenhouse Square Harlequin	TBD	3" x 6"	Wall Tile Accent 20%
093000.T5 Tile 5					
093000.T6 Tile 6					
093000.T7 Tile 7					
095100- Suspended Acoustical Ceilings	**Manuf.**	**Panel Name**	**Panel Size/Color**	**Grid Name**	**Remarks**
095100.AC2 Acoustical Ceiling 1	Armstrong	Dune 1775	24" x 24"/whiter	Suprafine 9/16" silver	
096500- Resilient Flooring	**Manuf.**	**Product Name**	**Color/ Pattern Name**	**Size**	**Remarks**
096500.RB1 Resilient Base	Allstate	4" cove Base	#63	120 foot coil	
096500 RTL 1 Linoleum Tile 1	Forbo	MCT	TBD	13" x 13"	Monolythic installation
096500 RTL 2 Linoleum Tile 2	Forbo	MCT	TBD	13" x 13"	Monolythic installation
096500 RTL 3 Linoleum Tile 3	Forbo	MCT	TBD	13" x 13"	Monolythic installation
096813- Carpet tile	**Manuf.**	**Product Name**	**Color/ Pattern Name**	**Size**	**Remarks**
096813.CT1 Carpet tile 1	TDB	TDB	TDB	TDB	$33.00 budget installed
099100 - Painting	**Manuf.**	**Color Name**	**Color Number**	**Color**	**Remarks**
099100.P1 Paint Color 1	TBD	TBD	TBD	TBD	Off white
099100.P3 Paint Color 3	TBD	TBD	TBD	TBD	Accent
099100.P4 Paint Color 4	TBD	TBD	TBD	TBD	Accent
099100.P5 Paint Color 5	TBD	TBD	TBD	TBD	Accent
099100.P6 Paint Color 6	TBD	TBD	TBD	TBD	Accent
099100.P7 Paint Color 7	TBD	TBD	TBD	TBD	Door frames and Interior Metal
099100.P8 Paint Color 8	Custom	Custom	To Match Ceiling tile 09511 AC1	Ceiling White	Gyp Ceilings and soffits
122113Horizontal Blinds	**Manuf.**	**Size**	**Size**	**Finish**	**Remarks**
122113.HB1 Horizontal Blinds 1	Bali	Aluminum Blinds	1" Slat	Brushed Aluminum	
122413.WS1	**Manuf.**	**Series**	**Color**	**Openess**	**Remarks**
122413.WS1 Fabric Glare Control Window Shades 1	Silent Gliss	Superscreen	0207 (front)	5%	Inside window install
	END OF FINISH LEGEND				

Finish Schedule 090615B	
Area	**Finish**
Meeting Room Addition	
Window Covering	122413.WS1
Floors	096500.RTL1, 096500.RTL2, 096500.RTL3
Base	062000.WT3
Walls	099100.P1, 099100.P2, 099100.P3, 099100.P4.
Interior Door Frames and Wood Trim	099100.P7
Reading Room	
Window Covering	122413.WS1
Floors	096800.CT1, 096800.CT2
Base	062000.WT3
Walls	099100.P1, 099100.P3, 099100.P4, .099100.P5
Interior Door Frames and Wood Trim	099100.P7
Study Room 1	
Window Covering	122413.WS1
Floors	096800.CT2
Base	062000.WT3
Walls	099100.P1, 099100.P2 .099100.P5
Interior Door Frames and Wood Trim	099100.P7
Study Room 2	
Window Covering	122413.WS1
Floors	096800.CT2
Base	062000.WT3
Walls	099100.P1, 099100.P2 .099100.P5
Interior Door Frames and Wood Trim	099100.P7
Study Room 3	
Window Covering	122413.WS1
Floors	096800.CT2
Base	062000.WT3
Walls	099100.P1, 099100.P2 .099100.P5
Interior Door Frames and Wood Trim	099100.P7
Study Room 4	
Window Covering	122413.WS1
Floors	096800.CT2
Base	062000.WT3
Walls	099100.P1, 099100.P2 .099100.P5
Interior Door Frames and Wood Trim	099100.P7
Women's Restroom	
Floors	093000.T3
Base	093000.T2
Walls	093000.T1, 099100.P1, 099100.P2, 099100.P4
Men's Restroom	
Floors	Strip, clean and regrout existing tile with epoxy grout TBD
Base	Strip, clean and regrout existing tile with epoxy grout TBD
Walls	Strip, clean and regrout Wall Tile with epoxy grout TBD, 099100.P1, 099100.P2, 099100.P6

SECTION 09 2116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior metal stud wall framing.

B. Interior metal shaftwall framing and bracing systems.

C. Gypsum wallboard.

D. Glass mat faced tile backing board.

E. Interior gypsum ceilings/soffits.

F. Joint treatment and accessories.

G. Level 5 finish under semi-gloss and gloss paint.

1.02 REFERENCES

A. ASTM C 475/C 475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2002 (Reapproved 2007).

B. ASTM C 645 - Standard Specification for Nonstructural Steel Framing Members; 2007.

C. ASTM C 754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2007.

D. ASTM C 840 - Standard Specification for Application and Finishing of Gypsum Board; 2007.

E. ASTM C 1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2007.

F. ASTM C 1178/C 1178M - Standard Specification for Glass Mat Water-Resistant Gypsum Backing Panel; 2006.

G. ASTM C 1396/C 1396M - Standard Specification for Gypsum Board; 2006a.

H. GA-216 - Application and Finishing of Gypsum Board; Gypsum Association; 2007.

1.03 SUBMITTALS

A. Product Data: Provide manufacturer's product data for systems required. Include installation instructions and data sufficient to show compliance with requirements.

B. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

C. Design Data:

1. Submit data substantiating gage and spacing of metal framing members to comply with specified loading requirements.
2. Submit data substantiating bracing requirements.
3. Submittal of manufacturer's standard published load tables, marked to show products selected to comply with design requirements and project conditions, will be acceptable. Where manufacturer's standard published load tables are not adequate to demonstrate compliance with design requirements and project conditions, submit design data bearing the seal of a professional engineer licensed to practice in the state in which the project is located.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original and unopened packages, containers, or bundles, with brand names and manufacturer's labels intact and legible.

B. Store materials in dry location, fully protected from weather and direct exposure to sunlight.

C. Stack gypsum board products flat and level, properly supported to prevent sagging or damage to ends and edges.

D. Store corner bead and other metal and plastic accessories to prevent bending, sagging, distortion, or other mechanical damage.

1.05 PROJECT CONDITIONS

A. Do not store or install products until building is fully enclosed and temperature and humidity controlled.

B. Temperature: Maintain temperature in areas of installation between 50 and 80 degrees F for at least 48 hours before installation begins and continuously thereafter.

C. Ventilation: Provide controlled ventilation and dehumidification.

D. Do not allow excessive variations in humidity or temperature.

PART 2 PRODUCTS

2.01 SUBSTITUTIONS

A. Refer to Section 01 6000 - Product Requirements.

2.02 METAL FRAMING MATERIALS

A. Non-Loadbearing Framing System Components: ASTM C 645; galvanized sheet steel of size and properties necessary to comply with ASTM C 754, for the spacing indicated.
   1. Studs: C-shaped with knurled faces.
      a. Nominal depths: As indicated in Section 09 0610 or as otherwise indicated on the drawings.
   2. Runners: U-shaped, sized to match studs.
      a. Nominal depths: As indicated in Section 09 0610 or as otherwise indicated on the drawings.
   3. Ceiling Channels: C-shaped, cold-rolled.
   4. Furring:
      a. Spaced at 16 inches on center unless otherwise indicated.
      b. Hat-shaped, minimum depth of 7/8 inch, except as otherwise indicated.
   5. Thickness: As require for span and loading, but not less than the following:
      a. All locations, unless otherwise indicated: 25 gage. So-called "EQ" or "equivalent gage" is not acceptable.
      b. Tile Backer Board Locations: 20 gage minimum. So-called "EQ" or "equivalent gage" is not acceptable.
   6. Stud spacing: 16 inches, maximum.
   7. Shaftwall framing spacing: 24 inches, maximum.
   8. Maximum deflection of wall framing of L/240 at 5 psf.
      a. For wall framing to receive ceramic tile: L/360 at 5psf.
   9. Maximum deflection of shaftwall framing of L/240 at 7.5 psf.

B. Establish bracing size and spacing for the following partitions. (See Section 09 0610 - Partition Schedule):
   1. Type A.
   2. Type SA.

3. Type U.
4. Type F and Z when furring is installed over spaced supports.

C. Ceiling Hangers: Type and size as specified in ASTM C 754 for spacing required.

D. Partition Head To Structure Connections:
1. Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short and screwed to secondary deflection channel set inside but unattached to top track.

2.03 GYPSUM BOARD MATERIALS

A. Gypsum Wallboard: ASTM C1396; sizes to minimize joints in place; ends square cut.
1. Thickness: 5/8 inch, all locations. 1/2 inch not acceptable.
2. Edges: Tapered; beveled or rounded.
3. Type X: Fire resistant, UL or WH rated.

B. Water Resistant Gypsum Backing Board: ASTM C 1396 Type X and ASTM C630; sizes to minimize joints in place; ends square cut.
1. Thickness: 5/8 inch.
2. Long Edges: Tapered.
3. Facing: Green Paper Face.
4. Location: Bathroom Walls - Except all wet walls.
5. Products:
a. Certainteed; ProRoc Type X.
b. LaFarge North America; Fire Watercheck Type X.
c. National Gypsum; Gold Bond Brand MR Board, Fire Shield..
d. USG Corporation; Sheetrock Brand Gypsum Panels, Water-Resistant, Firecode.

C. Glass Mat Faced Gypsum Backing Board: ASTM C 1178.
1. Core: Water-resistant silicone-treated gypsum core complying with ASTM C 630.
2. Facers: Alkali-resistant fiberglass mat front and back. Front face surfaced with water and vapor barrier coating.
3. Thickness: 5/8 inch, Type X.
4. Product:
a. Georgia-Pacific Corporation: Dens-Shield Tile Backer Firestop Type X.

D. Gypsum Shaftwall or Coreboard: ASTM C1396; sizes to minimize joints in place; 1 inch thick; square edges, ends square cut.

2.04 ACCESSORIES

A. Except as otherwise specifically indicated, provide trim and accessories by manufacturer of gypsum board materials, made of galvanized steel or zinc alloy and configured for concealment in joint compound.
1. Include corner beads, edge trim, and other trim units necessary for project conditions. Provide accessories as required in order to achieve details indicated, whether or not specific accessories are shown on the drawings.
2. Exposed trim: At locations indicated, provide manufacturer's standard metal units designed to be left exposed or semiexposed.

B. Corner Beads: Galvanized steel.

C. Edge Trim: Bead types as detailed.

D. Control Joints: At locations indicated, provide manufacturer's standard one-piece control joints of zinc alloy.

E. Joint Materials: ASTM C 475 and as recommended by gypsum board manufacturer for project conditions.
   1. Joint Compound:
      a. General Interior Use: Ready-mixed vinyl-based joint compound. All-purpose taping and topping compound: type specifically formulated for embedding tape and accessories, for prefilling, and for finishing drywall.
      b. Water-resistant gypsum board intended for tile surfacing: Provide setting type compound specifically recommended by manufacturer of gypsum board.
      c. Glass mat faced gypsum backing board: Tile setting compound as specified in tile section.
   2. Joint Tape:
      a. Gypsum wallboard: Provide manufacturer's standard paper type tape.
      b. Water-resistant Gypsum Backing Board: Provide open-weave fiberglass tape.
      c. Glass mat faced backer board:
         1) "Contractor Sheathing Tape No. 8086", 2 inch minimum width; 3M Corporation.
         2) "Perma-Tite Self-Adhering Fiberglass Joint Tape", 2 inch minimum width; Perma Glas-Mesh Corp.
         3) "Quik-Tape", 2 inch minimum width; Quik-Tape, Inc.

F. Screws: ASTM C 1002; self-piercing tapping type, lengths as recommended by gypsum board manufacturer for project conditions.
   1. Provide cadmium-plated screws for glass mat faced gypsum backing board.

G. Furring Fasteners/Connectors: Manufacturer's recommended system for specific application indicated, complying with ASTM C 754.

H. Hanger Wire: ASTM A 641, soft, Class 1 galvanized.
   1. Ceiling hangers: Minimum 8 gage wire.
   2. Furring channel ties: Minimum 18 gage wire.

I. Blocking: Provide metal blocking for mounting of wall cabinets, shelves, toilet accessories, etc.
   1. Provide 6 inch, 16 gage, steel runner notched to bypass steel studs and secured with two 3/8 inch pan head screws.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions and substrates are appropriate for work of this section to commence.

B. Coordinate installation of anchorage devices for suspended ceilings/soffits, verifying that spacing and rated strength are correct for anticipated load conditions.

3.02 FRAMING INSTALLATION

A. Comply with ASTM C 754 and manufacturer's instructions.

B. Fire-rated assemblies: Comply with requirements of tested assemblies.

C. Studs:
   1. Extend partitions to structure unless otherwise indicated.
   2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.

3. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs with continuous bridging.
4. Slab Deflection: At fire-rated partitions, construct slip-joint head in accordance with UL-witnessed reports and manufacturer's recommendations.

D. Partition heights:
1. Where not indicated otherwise, extend partitions from floor to underside of solid structure above.
2. Where indicated, extend partitions to underside of suspended ceiling or to just above suspended ceiling, as indicated.
a. Brace partial height partitions in accordance with design requirements specified in Part 1 of this Section.
3. Blocking and bracing: Install blocking and bracing as recommended by manufacturer for adequate support of wall-mounted items installed as work of other sections.

E. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double 20 gage, side-by-side studs at jambs on both sides of opening.
1. At openings in fire rated partitions, comply with requirements of governing authorities for framing.

F. Standard Wall Furring: Install at concrete and masonry walls scheduled to receive gypsum board, not more than 4 inches from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 24 inches on center.
1. Orientation on solid walls: Vertical.
2. Spacing: At 16 inches on center.

G. Blocking: Install blocking for support of plumbing fixtures, toilet partitions, wall cabinets, toilet accessories, shelving, and other fixture mounted on partitions. Screw steel blocking channels to studs.

H. Suspended Ceilings and Soffits:
1. Secure hangers to structure or to anchorage devices so that full strength of hanger can be achieved.
a. Install ceiling channels at spacing indicated or required, but not greater than permitted by ASTM C 754.
b. Secure furring members to ceiling channels by means of clips or wire ties.
2. Level ceiling system to a tolerance of 1/8 inch in 12 feet, or to a higher tolerance if required by specific project conditions.
3. Level soffits to a tolerance of 1/8 inch in 12 feet, or to a higher tolerance if required by specific project conditions.
4. Reinforce openings and interruptions in horizontal framing system with additional furring channels. Ensure that entire suspension system is laterally braced.

3.03 GYPSUM BOARD INSTALLATION

A. Comply with ASTM C 840 and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Fire-rated assemblies: Comply with requirements of tested assemblies.

C. Apply ceiling boards prior to installation of wallboards. Arrange to minimize butt end joints near center of ceiling area.

D. Install wallboards in a manner which will minimize butt end joints in center of wall area. Stagger vertical joints on opposite sides of walls.

E. Butt all joints loosely, with maximum of 1/16 inch between boards.

F. Size panels to provide perimeter relief and install over sealant as specified under noise control, above. Do not install panels unless and until sealant is properly installed.

G. Place wrapped edges adjacent to one another; do not place cut edges or butt ends adjacent to wrapped edges.

H. Support all edges and ends of each board on framing or by solid substrate, except that long edges at right angles to framing members in non-fire-rated construction may be left unsupported.

I. Single-Layer: Install gypsum board vertically, with ends and edges occurring over firm bearing.
   1. On walls and partitions, plan installation so that the leading edge or end of gypsum board is attached to open end of stud flange first.

J. Double-Layer Installation: Use gypsum backing board or gypsum wallboard for first layer, placed perpendicular to framing or furring members. Place second layer perpendicular to first layer. Offset joints of second layer from joints of first layer.
   1. In ceiling work, install base layer with long edges perpendicular to framing members, with face layer in opposite direction, and with all joints offset.
   2. In wall work, install base layer with long edges parallel to framing members with face layer in opposite direction, and with all joints offset.
   3. Install face layer by means of screws at least 3/8 inch longer than total thickness of gypsum board layers, spaced as specified for the tested assembly.

K. Gypsum Backing Board:
   1. Install water-resistant backing board on partitions to receive tile, except where high-performance gypsum backing board is required.
   2. Install water-resistant gypsum backing board in accordance with manufacturer's recommendations for installation, including minimum clearances and sealing of penetrations and edges.
   3. Do not install water-resistant backing board on ceilings or over vapor retarders.

L. Glass Mat Faced Gypsum Backing Board:
   1. Install water-resistant backing board on partitions to receive tile.
   2. Install panels over framing. Butt joints together with 1/8 inch space at joints. Layout work and use appropriate length material to avoid end joints. Joints shall occur over framing members. Stagger end joints between adjacent panels.
   3. Place uncoated rear face against studs, so that coated front face will receive tile or other finish.
   4. Fit panels snugly around penetrations and openings.
   5. Drive fasteners tight against and flush with panel surface. Do not countersink fasteners.
   6. Locate fasteners not closer than 3/8 inch from edge and ends of panels.
   7. Space fasteners at not more than 8 inches on center at perimeter and field, unless closer spacing is indicated on the drawings.

3.04 SHAFT WALL INSTALLATION

A. Comply with manufacturer's printed installation instructions, standard details, and recommendations.

B. Metal Perimeter Framing:
   1. Accurately position runners at floor and ceiling, with short leg to finish room side.

2. Attach runners to structure with appropriate power-driven fasteners, spaced at not more than 24 inches on center.
3. Install metal studs, struts, or vertical runners as recommended by manufacturer at intersection of shaftwall and structural framing, at corners and T-shaped intersections, and at openings.

C. Shaft Wall Liner:
1. Cut liner panels accurately to a dimension 3/4 inch to 1 inch less than wall height. Install sequentially between special metal studs designed to hold liner panels by friction at shaft side of wall.
2. On walls over 16 feet in height, screw-attach studs to runners top and bottom.
3. When maximum panel length available is less than shaftwall height, position horizontal joint within top third and bottom third of wall, alternating location at adjacent panels.

D. Door Openings:
1. Comply with manufacturer's details for installation of minimum 20 gage metal struts or studs at head and jambs. Spot grout one-piece metal frames after liner panels have been installed.
2. Support elevator door frames, accessories, and operating mechanisms independently of gypsum board shaftwall system.

E. Boxes and Recessed Accessories: Maintain fire separation at openings by adding protection behind recessed components in accordance with manufacturer's details for tested assemblies.

F. Structural Support: Provide supplemental blocking, framing, furring, and reinforcement as recommended by manufacturer and as required to properly support elements attached to non-load bearing shaftwall system.

3.05 INSTALLATION OF TRIM AND ACCESSORIES

A. Comply with manufacturer's recommendations for installation of trim items. Except for items intended by manufacturer to be left exposed or semiexposed, install trim units for concealment in joint finishing compound. Wherever possible, fasten metal trim items to substrate with same fasteners used to install gypsum board products.

B. Control Joints: Where control joints are indicated on the drawings, place control joints as shown on the drawings. Where control joints are not indicated on the drawings, place control joints consistent with lines of building spaces and as follows:
1. Not more than 30 feet apart on walls and ceilings over 50 feet long.
2. Install one-piece control joints at required locations. Do not remove tape until finishing operations are complete.

C. Corner Beads: Install at external corners, unless details clearly indicate its omission at specific locations. Use longest practical lengths.

D. Isolation Joints: Where gypsum board construction abuts cabinetry, windows, structural components, and other dissimilar materials, provide isolation by stopping board a minimum of 1/4 inch from structure, for finishing by means of exposed or semiexposed trim.

3.06 JOINT TREATMENT

A. Finish gypsum board in scheduled areas in accordance with levels defined in ASTM C 840.

B. Do not mix joint compounds except as specifically recommended by manufacturer.

C. Joint Treatment for Glass Mat Faced Gypsum Backing Board to Receive Tile:
1. Fill joints between backing boards with tile setting mortar.

2. Apply self-adhering fiberglass sheathing tape to all joints, corners, and openings; overlap tape intersections for a width equal to tape width.
3. Embed tape in tile setting material.
4. Allow joints to dry before proceeding with tile installation.

D. Penetrations in Wallboard: Fill cutouts and openings around fixtures and penetrations with joint compound.

E. Penetrations in Gypsum Backing Board: Seal cut edges with elastomeric sealant specified in Division 7.

3.07 CLEANING

A. Promptly remove any residual gypsum drywall materials from adjacent or adjoining surfaces, leaving spaces ready for subsequent finishing operations and decorating.

3.08 FINISH LEVEL SCHEDULE

A. Provide a Level 4 finish for surfaces not otherwise indicated.

B. Level 1: Above finished ceilings concealed from view; from 8 inches (203 mm) above suspended ceilings to top of partition.
1. Embed tape in joint compound at all joints and interior angles; provide accessories only as detailed.
2. Provide surfaces free of excess joint compound; tool marks and ridges are acceptable.

C. Level 2: Under tile finishes; utility areas, and areas behind cabinetry.
1. Embed tape in joint compound at all joints and interior angles.
2. Provide one separate coat of compound at all joints, angles, fastener heads, and accessories.
3. Provide surfaces free of excess joint compound; tool marks and ridges are acceptable.

D. Level 4: Surfaces scheduled to receive the following:
1. Flat or eggshell paint finish specified in Section 09 9100 - Paints and Coatings.
2. Application:
a. Embed tape in joint compound at all joints and interior angles.
b. Provide three separate coats of compound at all joints, angles, fastener heads, and accessories.
c. Provide smooth surfaces free of tool marks and ridges.

E. Level 5: Walls and/or ceilings scheduled to receive the following:
1. Semi-gloss or gloss paint finish specified in Section 09 9100 - Paints and Coatings.
2. Application:
a. Embed tape in joint compound at all joints and interior angles.
b. Provide three separate coats of compound at all joints, angles, fastener heads, and accessories.
c. Apply a thin skim coat of joint compound or a special-purpose coating to the entire gypsum board surface.
d. Provide smooth surfaces free of tool marks and ridges.

END OF SECTION

SECTION 09 3000

TILE

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Tile.
   2. Tile setting materials.

1.02 REFERENCES

A. ANSI A108.5 - Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar; 1999 (R2005).

B. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile Setting and Grouting Epoxy and Water Cleanable Tile Setting Epoxy Adhesive; 1999 (R2005).

C. ANSI A118.4 - American National Standard Specifications for Latex-Portland Cement Mortar; 1999 (R2005).

D. CTI 69-5 -- Standard Test Method for Glazed and Unglazed, Special Purpose and Faience Ceramic Tile; Ceramic Tile Institute; 2001.

E. TCNA -- Handbook for Ceramic Tile Installation; Tile Council of North America, Inc. (TCNA) 2004.

1.03 SUBMITTALS

A. Product Data: Written product information which demonstrates materials to be used on the project comply with contract documents.

B. Samples for Verification Purposes: Submit the following:
   1. Submit each tile type selected mounted on a minimum 12 inch square board with joints filled using selected grout.
   2. Metal edge trim: 6-inch long samples.

1.04 QUALITY ASSURANCE

A. Material Source: Furnish each type, finish, and color of tile product and accessory materials from a single supplier.

B. Tile Work Mock-up: To establish an acceptable standard of quality for comparison during installation, as well as to verify types of materials submitted, construct a 4 foot x 4 foot mock-up for each tile type, setting materials, and grout.
   1. Locate mock-ups as instructed by the Architect.
   2. Do not start installation work until Architect accepts mock-ups.
   3. After installation and when directed by Architect, remove mock-ups from project site.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store tile products and setting materials in manufacturer's sealed packages. Protect material from damage and store in dry location.

1.06 PROJECT CONDITIONS

A. Provide temperatures in tiled areas during installation and after completion as required by referenced installation standard or manufacturer's instructions, but not less than 50 degrees F.

B. If necessary to use temporary heaters, vent units to exterior to protect tile work from carbon dioxide accumulation.

1.07 MAINTENANCE

A. Extra Materials: Deliver supply of maintenance materials to the Owner. Furnish maintenance materials from same lot as materials installed, and enclosed in protective packaging with appropriate identifying labels.
   1. Furnish not less than 2 percent of total product installed maintenance stock for each type, color, pattern, and size of tile product installed.

PART 2 PRODUCTS

2.01 SUBSTITUTIONS

A. Refer to Section 01 6000 - Product Requirements.

2.02 MATERIALS - GENERAL

A. Ceramic Tile Standard: ANSI A137.1. Tile grade: "Standard Grade," unless noted otherwise.

B. Tile Installation Materials Standard: ANSI standard referenced for setting and grouting materials.

C. Special Purpose and Faience Tile Standard: CTI Test Procedure CTI-69-5 for tile indicated.

D. Colors, Textures, and Patterns, Tile, Grout, and Other Products: Match colors indicated or as scheduled on drawings.

E. Color Blending: Factory-blend tile products which have a natural color range so products taken from one box will have the same range as products from a separate box.

F. Tile Mounting: Manufacturer's standard factory back- or edge-mounting.

2.03 TILE PRODUCTS: REFERENCE SECTION 090615A FINISH LEGEND

2.04 SETTING, GROUTING, AND WATERPROOFING MATERIAL MANUFACTURERS

A. Provide products of a single manufacturer, unless otherwise required and approved.

2.05 SETTING MATERIALS

A. Latex-Portland Cement Mortar: Two-component, dry mortar mix and liquid latex additive, field-mixed; complying with ANSI A118.4.
   1. All components premeasured and prepackaged.
   2. Liquid latex additive: Acrylic resin water emulsion.
   3. Mix in accordance with manufacturer's recommendations.
   4. "Tile-Mate Premium" plus "Hydroment Multi-Purpose Acrylic Latex mortar Admixture and Grout Additive #425;" Bostik Inc.
   5. "Laticrete 4237 Thin Set mortar Additive" (2.39 g/l) plus "Laticrete 211 Crete Filler Powder;" Laticrete International, Inc.
   6. "Kerabond" plus "Keralastic;" Mapei Corporation.

B. Flexible Latex-Portland Cement Mortar: Two-component, dry grout mix and liquid latex additive, field-mixed; complying with ANSI A118.4.
   1. All components premeasured and prepackaged.
   2. Liquid latex additive: Acrylic resin water emulsion.
   3. Mix in accordance with manufacturer's recommendations.
   4. "Tile-Mate" plus "Hydroment Flex-A-Lastic Flexible Mortar Admixture #447;" Bostik Inc.

2.06 GROUTING MATERIALS

A. Chemical-Resistant, Water-Cleanable Ceramic Tile Setting and Grouting Epoxy: ANSI A118.3.

1. "Hydroment Color-Poxy"; Bostik Inc.
   a. Regular flow for horizontal joints.
2. "Latapoxy SP-100 Stainless Epoxy Grout" (0.80 g/l); Laticrete International, Inc.
3. "Kerapoxy"; Mapei Corporation.

B. Grout Color: TBD.

2.07 PATCHING AND LEVELING COMPOUND

A. Portland cement base, acrylic polymer compound, manufactured specifically for resurfacing and leveling concrete floors.

B. Have not less than the following physical properties:
1. Compressive strength - 3500 psi.
2. Tensile strength - 1000 psi.
3. Flexural strength - 1000 psi.

C. Capable of being applied in layers up to two inches thick, being brought to a feather edge, and being troweled to a smooth finish.

D. Ready for use in 48 hours after application.

2.08 MISCELLANEOUS MATERIALS

A. Tile Cleaner: Acidic tile cleaners are not acceptable. Provide products specifically recommended by grout manufacturer for type of grout and tile used, such as the following:
1. Commercial detergent or trisodium phosphate.
2. Dry grout powder.
3. Methyl alcohol.

B. Edge strips:
1. Manhattan American Terrazzo Strip.
2. 1/8-inch-wide exposed edge.
3. Recessed depth:
   a. 3/16 inch where abutting carpet.
   b. 1/8 inch where abutting resilient tile..
4. Material:
   a. Zinc top, triple-zinc-coated steel bottom.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify with the installer that substrate areas where tile is to be installed have been prepared correctly, and that all backing materials have been installed. Correct unacceptable conditions before start of tile work.

B. Verify that concrete substrates have not been cured with membrane-forming curing compounds. The following types of curing are suitable to receive tile or bonded mortar beds:
1. Continuous moist curing methods.
2. Moisture-retaining sheet materials.
3. Chemical hardening type curing compounds.
4. Membrane-forming curing compounds are acceptable only where thick-bed with cleavage membrane will be installed.

C. Correct unsuitable substrates before proceeding.

3.02 PREPARATION

A. Factory-Blending: Before start of installation verify that tile with an anticipated range of colors has been correctly blended to achieve a uniform color range from tile package to tile package.

B. Surface Preparation, Existing Substrates:
   1. Remove existing floor finishes, mortars, and adhesives, etc. Prepare surface by grinding, chipping, self-contained power blast cleaning or other suitable mechanical methods to completely expose uncontaminated concrete or masonry surfaces.

C. Patching and Leveling:
   1. Mix and apply patching and leveling compound in accordance with manufacturer's instructions.
   2. Fill holes and cracks and level concrete floors that are out of required plane with patching and leveling compound.
   3. Thickness of compound shall be as required to bring finish tile system to elevation shown.

D. Floors:
   1. Membrane-forming curing compounds, if used, shall be completely removed by abrasive blast cleaning, vigorous wire brushing, or scarifying. Acid cleaning is not acceptable, unless specifically approved by the Architect.

E. Walls:
   1. Apply patching and leveling compound to concrete and masonry surfaces that are out of required plane.
   2. Apply leveling coats of material compatible with wall surface and tile setting material to wall surfaces, other than concrete and masonry, that are out of required plane.

3.03 INSTALLATION - GENERAL

A. Tile Installation Standard:
   1. ANSI A108 series, for setting and grouting materials listed.
   2. Comply with TCNA "Handbook for Ceramic Tile Installation" for type of applications indicated.

B. Set tile firmly in place with finish surfaces in true planes.
   1. Seal tile joints water tight around electrical outlets, piping fixtures, and fittings before cover plates and escutcheons are set in place.
   2. Completed work shall be free from:
      a. Hollow sounding areas.
      b. Loose or cracked or scratched tile.
      c. Out of plane or misaligned tile.
      d. Mismatched patterns or colors.
      e. Grout haze or other stains.
      f. Other defects.

C. Install tile under or behind equipment and fixtures.

D. Carefully cut, drill, and grind tile to fit around items projecting through tile surface, so that escutcheons or cover plates conceal cut edges, and without marring tile surface.

E. Joint Patterns: Lay out tile according to patterns indicated on drawings, or if not shown, in a grid pattern with floor joints aligning with wall and trim joints. Install joints straight and of uniform width. Neatly form intersections and returns.
   1. Lay out tile work so that no tile less than one-half full size is used. Make all cuts on the outer edge of the field.

2. Joint size, unless otherwise indicated:
   a. As directed by the Architect.

F. Sealant-Filled Joints: Install joints in the locations listed below, and elsewhere indicated on the drawings. (The locations listed below are not typically detailed on the drawings.) Saw-cut joints are unacceptable. Joint installation method: TCA EJ 171.
   1. Between floor tile and base tile or other hard finish material at walls, curbs, columns, pipes, and similar conditions.
   2. Where changes occur in floor or wall substrates. Locate joint in tile directly over joint in substrate.
   3. Where control, construction, or cold joints occur in floor or wall substrates. Locate joint in tile directly over joint in substrate.

G. Remove and reset defective work.

3.04 TILE APPLICATIONS

A. Application 09 3000.HLE: Horizontal tile, latex mortar, TCNA F113; epoxy grout, TCNA F115.
   1. Bond coat: Latex-portland cement mortar, ANSI A108.5.
   2. Grout: Epoxy, ANSI A108.6.

B. Application 09 3000.HXE: Horizontal tile, flexible latex mortar, epoxy grout: TCNA F113/F114.
   1. Bond coat: Flexible-type latex-portland cement mortar, ANSI A108.5.
   2. Grout: Epoxy, ANSI A108.6.

3.05 SEALING OF JOINTS

A. Rake out joints for installation of sealant specified elsewhere.
   1. At thin-set assemblies, rake out joint full depth of tile.

B. Install sealant in accordance with requirements specified elsewhere.

3.06 CLEANING AND PROTECTION

A. Clean tile surfaces after installation is complete.
   1. Remove grout residue from tile as soon as possible after tile installation and in strict accordance with manufacturer's instructions.
   2. Tile that is stained or which contains grout haze after cleaning will be considered defective, and shall be removed and replaced with new tile at no cost to the Owner.

B. Replace any broken, chipped, marred, or otherwise damaged tile before final acceptance.

C. Protection: Apply neutral protective cleaner to tile after installation if recommended by tile manufacturer. Overlay completed tile installation with kraft paper for protection from subsequent construction activities.

D. Do not allow any traffic on completed tile floors for minimum 7 days after completion.

E. Remove protection, rinse, and dry tile installations before final review and acceptance.

END OF SECTION

SECTION 09 5100
SUSPENDED ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

C. Accessories.

1.02 REFERENCES

A. ASTM C 635 - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2004.

B. ASTM C 636 - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels; 2006.

C. ASTM E 1264 - Standard Classification for Acoustical Ceiling Products; 1998 (Reapproved 2005).

1.03 SUBMITTALS

A. Shop Drawings: Indicate grid layout and related dimensioning, junctions with other ceiling finishes, and mechanical and electrical items installed in the ceiling.

B. Product Data: Provide data on suspension system components and acoustical units.

C. Samples: Submit three samples, minimum 6 inches by 6 inches, illustrating material and finish of acoustical units.

D. Samples: Submit three samples each, 9 inches long, of suspension system main runner and perimeter molding.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.04 PROJECT CONDITIONS

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

B. Install acoustical units after interior wet work is dry.

1.05 EXTRA MATERIALS

A. Provide 5percent of total acoustical unit area of each type of acoustical unit for Owner's use in maintenance of project.

PART 2 PRODUCTS

2.01 ACOUSTICAL UNITS

A. Manufacturers; General:
   1. Armstrong World Industries, Inc: www.armstrong.com.
   2. CertainTeed: www.certainteed.com.
   3. USG: www.usg.com.

B. Acoustical Units (AC1):
   1. Acoustical Panel: Painted mineral fiber, ASTM E 1264, Type III, Class A, with the following characteristics determined as specified in ASTM E 1264.
      a. Size: 24 x 24 inches.

b. Thickness: 5/8 inch.
c. Composition: Water felted.
d. Light Reflectance: Not less than 0.80.
e. Noise Reduction Coefficient (NRC): Not less than 0.40.
f. Ceiling Attenuation Class (CAC): Not less than 35.

2. Products:
a. Armstrong:
1) Acoustical Panel: Dune 1775, tegular edge.
2) Suspension System: Suprafine XL 9/16 Heavy Duty.
b. CertainTeed:
1) Acoustical Panel: Sand Micro SHM-150, narrow reveal edge.
2) Suspension System: Elite Narrow Stab System 9/16 Heavy Duty.
c. USG:
1) Acoustical Panel: Olympia Micro ClimaPlus 4231, shadow line edge.
2) Suspension System: Centricitee 9/16 Heavy Duty.

2.02 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

B. Perimeter Moldings: Same material and finish as grid.
1. At Exposed Grid: Provide L-shaped molding for mounting at same elevation as face of grid.

C. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.02 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C 636 and manufacturer's instructions and as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:240.

C. Locate system on room axis according to reflected plan.

D. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.

E. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

F. 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.

G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

H. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

I. Do not eccentrically load system or induce rotation of runners in excess of 2 degrees.

J. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Use longest practical lengths.
   2. Miter corners.

3.03 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Lay directional patterned units with pattern parallel to shortest room axis.

D. Fit border trim neatly against abutting surfaces.

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. Cutting Acoustical Units:
   1. Cut to fit irregular grid and perimeter edge trim.
   2. Make field cut edges of same profile as factory edges.
   3. Double cut and field paint exposed reveal edges with manufacturer's recommended paint.

H. Where round obstructions occur, provide preformed closures to match perimeter molding.

3.04 ERECTION TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

END OF SECTION

SECTION 09 6500
RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient tile flooring.
   1. Resilient Linoleum tile
B. Resilient base.
C. Installation accessories.

1.02 REFERENCES

A. ASTM F 710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2008.
B. ASTM F 1066 - Standard Specification for Vinyl Composition Floor Tile; 2004.
C. ASTM F 1861 - Standard Specification for Resilient Wall Base; 2002.
D. RFCI - Recommended Work Practices for Removal of Resilient Floor Coverings; Resilient Floor Covering Institute; 1998.

1.03 SUBMITTALS

A. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions. Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.
B. Test Reports: Slab vapor transmission.
C. Verification Samples: Submit two samples, 6 by 6 inch in size illustrating color and pattern for each product specified.

1.04 ENVIRONMENTAL REQUIREMENTS

A. Maintain temperature in storage area between 55 degrees F and 90 degrees F.
B. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

1.05 EXTRA MATERIALS

A. Provide 5 percent of installed resilient product of each type and color specified.

PART 2 PRODUCTS

2.01 MATERIALS - TILE FLOORING

A. Resilient Linoleum Tile: ASTM F 1066, Class 2; homogeneous, with color extending throughout thickness.
   1. Size: 13 x 13 inch.
   2. Thickness: 0.125 inch.
   3. Products:

2.02 MATERIALS - BASE

A. Resilient Base: ASTM F 1861, Type TP thermoplastic rubber.
   1. Height: 4 inches.
   2. Thickness: 0.125 inch thick.
   3. Finish: Matte.

4. Style: Cove.
5. Length: Roll, 100-120 feet.

B. Products:

2.03 ACCESSORIES

A. Subfloor Filler: Portland cement-based premix latex; type recommended by flooring manufacturers.

B. Primers and Adhesives: Waterproof; type recommended by flooring manufacturers.

C. Sealer and Cleaning Products: Types recommended by flooring manufacturer.

D. Transitions: To match rubber base at RLT and Carpet transitions

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are smooth and flat within the tolerances specified for that type of work, are free of substances which would impair bonding of adhesive materials, and are ready to receive resilient product.

B. Verify that concrete subfloor surfaces are ready for resilient flooring installation by testing for moisture emission rate and alkalinity in accordance with ASTM F 710; obtain instructions from manufacturer if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

C. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Remove existing resilient floor covering in accordance with RFCI Recommended Work Practices for Removal of Resilient Floor Coverings.

B. Remove existing adhesive residue.

C. Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.

D. Prohibit traffic until filler is cured.

E. Clean substrate.

3.03 INSTALLATION - TILE FLOORING

A. Install in accordance with manufacturer's instructions.

B. Mix tile from different containers to ensure shade variations are consistent when tile is placed.

C. Spread only enough adhesive to permit installation of materials before initial set.

D. Set flooring in place, press with heavy roller to attain full adhesion.

E. Lay flooring with joints and seams parallel to building lines to produce symmetrical tile pattern, unless indicated otherwise in drawings.

F. Where floor finishes are different on opposite sides of door, terminate flooring under centerline of door.

G. Install transition strips at unprotected or exposed edges, where flooring terminates, and where indicated.

H. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.04 INSTALLATION - BASE

A. Cut vertical joints and fit tightly. Maintain minimum dimension of 18 inches between joints.
B. At external corners, v-cut back of base strip to two-thirds of its thickness and fold.
C. Miter cut internal corners.
D. Install base on solid backing. Bond tightly to surfaces.
E. Scribe and fit to door frames and other interruptions.

3.05 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.
B. Clean, seal, and wax resilient flooring products in accordance with manufacturer's instructions.

3.06 PROTECTION OF FINISHED WORK

A. Prohibit traffic on resilient flooring for 48 hours after installation.
B. Protect installed products until completion of project.

END OF SECTION

SECTION 09 6800
CARPET

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Carpet tile, fully adhered.

B. Removal of existing carpet.

C. Removal of existing carpet tile.

1.02 REFERENCES

A. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2008.

B. CRI (GLA) - Green Label Testing Program - Approved Adhesive Products; www.carpet-rug.org; current edition.

C. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; National Fire Protection Association; 2006.

1.03 SUBMITTALS

A. Shop Drawings: Indicate seaming plan, method of joining seams, direction of carpet pile and pattern, location of edge moldings and edge bindings, and layout of flat wire system.

B. Documentation of manufacturer's maintenance agreement take-back program green lease for carpet. Include the following:
   1. Appropriate contact information.

C. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

D. Samples: Submit two full tile samples illustrating color and pattern for each carpet and cushion material specified.

E. Manufacturer's Installation Instructions: Indicate special procedures.

F. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing carpet with minimum three years experience.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

B. Maintain minimum 70 degrees F ambient temperature 24 hours prior to, during and 24 hours after installation.

C. Ventilate installation area during installation and for 72 hours after installation.

1.06 MAINTENANCE

A. Extra Materials
   1. Provide 5% of carpet tiles of each color and pattern selected.

PART 2 PRODUCTS

2.01 SUBSTITUTIONS

A. Refer to Section 01 6000 - Product Requirements.

2.02 CARPET TILE

A. Carpet Tile Type Reference Section 090615-00A: Tufted, manufactured in one color dye lot.

2.03 ACCESSORIES

A. Sub-Floor Filler: Type recommended by carpet manufacturer.

B. Adhesives - General: Compatible with materials being adhered; CRI Green Label certified; in lieu of labeled product, independent test report showing compliance is acceptable.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive carpet.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive carpet.

C. Verify that sub-floor surfaces are dust-free and free of substances which would impair bonding of adhesives to sub floor surfaces.

D. Verify that concrete sub-floor surfaces are ready for carpet installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by carpet manufacturer and adhesive materials manufacturer.

E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Remove existing carpet and carpet cushion.

B. Remove existing carpet tile.

C. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler.

D. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.

E. Clean substrate.

3.03 SITE ENVIRONMENTAL PROCEDURES

3.04 CARPET TILE INSTALLATION

A. Install carpet tile in accordance with manufacturer's instructions and CRI 104.

B. Blend carpet from different cartons to ensure minimal variation in color match.

C. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

D. Lay carpet tile in monolithic pattern, with pile direction parallel to next unit, set parallel to building lines.

E. Locate change of color or pattern between rooms under door centerline.

F. Fully adhere carpet tile to substrate.

G. Trim carpet tile neatly at walls and around interruptions.

H. Complete installation of edge strips, concealing exposed edges.

3.05 CLEANING

A. Remove excess adhesive from floor and wall surfaces without damage.
B. Clean and vacuum carpet surfaces.

END OF SECTION

SECTION 09 9100
PAINTS AND COATINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Paints and Coatings on Exterior Substrates.
   1. Galvanized metals.
   2. Wood, painted.
   3. Hardboard siding, painted.

D. Paints and Coatings on Interior Substrates.
   1. Ferrous metals.
   2. Galvanized metals.
   3. Gypsum board.
   4. Gypsum board ceilings.
   5. Wood doors and trim, painted.

E. See Schedules at end of this Section.

1.02 REFERENCES

A. ASTM D 16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2007.

B. ASTM D 523 - Standard Test Method for Specular Gloss; 1989 (Reapproved 1999).

C. ASTM D 4214 - Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films; 2007.

D. SSPC (PM1) - Steel Structures Painting Manual, Vol. 1, Good Painting Practice; Society for Protective Coatings; 1993, Third Edition.
   1. SSPC-SP 1 - Solvent Cleaning; 1982 (Ed. 2004) (Part of Steel Structures Painting Manual, Vol. Two).
   2. SSPC-SP 2 - Hand Tool Cleaning; 1982 (Ed. 2004).
   3. SSPC-SP 3 - Power Tool Cleaning; 1982 (Ed. 2004).
   4. SSPC-SP 7 - Brush-Off Blast Cleaning; 2006.
   5. SSPC-SP 11 - Power Tool Cleaning to Bare Metal; 1987 (Ed. 2004) (Part of Steel Structures Painting Manual, Vol. Two).

1.03 DEFINITIONS

A. Conform to ASTM D 16 for interpretation of terms used in this section.

B. Gloss Ranges: Tested in accordance with ASTM D 523.
   1. Flat refers to a lusterless or matte finish with a gloss range between 0 and 5 when measured at a 60-degree meter.
   2. Eggshell refers to low-sheen finish with a gloss range between 5 and 20 when measured at a 60-degree meter.
   3. Satin refers to low-to-medium-sheen finish with gloss range between 15 and 35 when measured at a 60-degree meter.
   4. Semi-gloss refers to medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.

5. Gloss refers to high-sheen finish with a gloss range more than 65 when measured at a 60-degree meter.

1.04 SUBMITTALS

A. Product Data: Provide data on all finishing products including:
   1. Manufacturer name.
   2. Product Type.
   3. Product Name.
   4. Product Number.
   5. Color.

B. Samples:

1.05 DELIVERY, STORAGE, AND PROTECTION

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing. Information shall be legible.

C. Use of off-brand containers or mixing buckets will not be allowed on the site.

D. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions. Protect from freezing.

1.06 PROJECT CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Do not apply exterior coatings during rain or snow, on surfaces coated with frost, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

C. Do not apply exterior coatings in windy and dusty conditions.

D. Do not apply exterior coatings in direct sunlight or on surfaces which will soon be warmed by the sun.

E. Application Temperatures for Waterborne Paints: Minimum 45 degrees F for interiors; minimum 50 degrees F for exterior; maximum 90 degrees F (32 degrees C), unless required otherwise by manufacturer's instructions. Maintain interior temperatures until paint is completely dry and cured.

F. Application Temperatures for Solvent Thinned Paints: Minimum 50 degrees F (10 degrees C) for interiors and exterior; maximum 95 degrees F (35 degrees C), unless required otherwise by manufacturer's instructions. Maintain interior temperatures until paint is completely dry and cured.

G. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

H. Ventilation: Ventilate affected areas during paint application. Exhaust solvent vapors outdoors, away from air intakes and people.

1.07 EXTRA MATERIALS

A. Supply 1 gallon of each color; store where directed.

B. Label each container with color in addition to the manufacturer's label.

PART 2 PRODUCTS

2.01 MANUFACTURERS - PAINTS

A. Benjamin Moore & Co: www.benjaminmoore.com.

B. PPG Architectural Finishes, Inc.: www.ppgaf.com.

C. The Sherwin-Williams Co: www.sherwin-williams.com.

2.02 MANUFACTURER - METAL CLEANER

A. Chemetall Oakite; Oakite 31: www.oakite.com.metal cleaner

2.03 PAINTS AND COATINGS - GENERAL

A. Do not use insecticides in paint materials

2.04 ACCESSORY MATERIALS

A. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified; commercial quality.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

3.02 PREPARATION

A. General:
   1. Start of the surface preparation or paint materials application will be construed as applicator's acceptance of the surfaces as satisfactory for application of materials.
   2. Surface Appurtenances: Remove electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.
   3. Surfaces: Correct defects and clean surfaces of substances which affect work of this section. Remove or repair existing coatings that exhibit surface defects.
   4. Marks: Seal with sealer compatible with primer and finish coats marks which may bleed through surface finishes.
   5. Impervious Surfaces: Remove mildew by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
   6. Reduce the gloss of glossy surfaces to be painted.
   7. Fill nail holes, cracks, chips, spalls, and similar damaged areas to match adjacent undamaged areas.
   8. Paint Removal:
      a. Remove flaking, cracking, blistering, peeling or otherwise deteriorated paint and paint failing adhesion testing, by scraping with hand scrapers.
      b. After scraping, remove large areas of paint on architectural details using sanders, heat guns or heat plates, or chemical paint removers. Do not use flame heat devices.
      c. When chemical strippers are used, neutralize substrate after stripping to a pH of 5 to 8.5.
      d. Remove paint to bare substrate or first sound paint layer.
      e. Paint removal shall not damage or mar the substrate material.
      f. After paint removal, featheredge and sand edges smooth of remaining chipped paint.

B. Uncoated Ferrous Metal Surfaces to be Painted: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand wire brushing in accordance with SSPC SP-2, or sandblasting in accordance with SSPC SP-7; clean by washing with solvent or detergent in accordance with SSPC SP-1. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime paint entire surface; spot prime after repairs.

C. Shop-Primed Ferrous Metal Surfaces to be Finish Painted:
   1. Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous.
   2. In flat, exposed surfaces to receive semi-gloss or gloss finish, fill dents, holes and similar voids and depressions in flat exposed surfaces with metal filler compound. Finish flush with adjacent surfaces.
   3. Clean surfaces with solvent in accordance with SSPC SP-1.
   4. Prime bare steel surfaces immediately upon detection.

D. Galvanized Surfaces to be Painted: Remove surface contamination and oils and wash with solvent in accordance with SSPC SP-1 or detergent. Wipe with metal cleaner, rinse, and wipe dry.

E. Gypsum Board Surfaces to be Painted:
   1. Fill minor defects with filler compound. Spot prime defects after repair.
   2. Remove loose dust and dirt by brushing with a soft brush, rubbing with a cloth, or vacuum cleaning. A damp cloth may be used when water based paint materials are to be applied. Allow to dry.

F. Wood:
   1. Wipe off dust and grit prior to priming.
   2. Scrape and clean small, dry seasoned knots, then apply a thin coat of commercial knot sealer, before application of the priming coat.
   3. Scrape off pitch on large, open, unseasoned knots and all other beads or streaks of pitch and sap. If the pitch is still soft, remove with mineral spirits or turpentine, and thinly coat the resinous area with knot sealer.
   4. Back prime concealed surfaces before installation.
   5. Sand between coats.
   6. Set finishing nails, fill holes, and prime surface imperfections. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler, colored to match the finish coat if natural finish is required, allowed to dry, and sand smooth.

G. Previously Painted Surfaces:
   1. Thoroughly remove all grease, dirt, dust or other foreign matter.
   2. Remove coatings that are blistering, cracking, flaking, peeling, or otherwise deteriorating.
   3. Roughen slick surfaces.
   4. Repair damaged areas such as, but not limited to, nail holes, cracks, chips, and spalls with suitable material to match adjacent undamaged areas.
   5. Feather edge edges of chipped paint, and sand smooth.
   6. Clean metal surfaces in accordance with SSPC requirements using solvent, mechanical, or chemical cleaning methods to provide surfaces suitable for painting. Preparation of ferrous surfaces if not specified shall as recommended by coating manufacturer, but in no case less than SSPC SP-3.
   7. Chalk shall be removed so that when tested in accordance with ASTM D 4214, the chalk resistance rating is no less than 8.

3.03 APPLICATION

A. Unless otherwise specified or recommended by the paint manufacturer, paint may be applied by brush, roller, or spray. Rollers for applying paints and enamels shall be of a type designed for the coating to be applied and the surface to be coated.
   1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
   2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
   3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.

B. Thinning:
   1. When thinning is required to suit surface, temperature, weather conditions, or application methods, paints may be thinned in accordance with the manufacturer's directions.
   2. The use of thinner shall not relieve the Contractor from obtaining complete hiding, full film thickness, or required gloss. Thinning shall not cause the paint to exceed limits on volatile organic compounds.

C. Do not mix paint materials of different manufacturers.

D. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

E. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

F. Apply each coat to uniform appearance. Apply each coat of paint in a tint slightly darker than preceding coat unless otherwise approved. Difference in tint shall be visible at a distance of 3 feet (0.9 m) from the surface.

G. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

H. Minimum Coating Thickness:
   1. Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness as recommended by manufacturer. Provide total dry film thickness of the entire system as recommended by manufacturer.
   2. Strip paint to ensure that all edges, corners, crevices, welds, and rivets receive a film thickness equal to that of adjacent painted surfaces.
   3. Apply each coat of paint so dry film shall be of uniform thickness and free from runs, drops, ridges, waves, pinholes or other voids, laps, brush marks, and variations in color, texture, and finish. Hiding shall be complete. If application thickness or color and opacity of the paint do not achieve complete hiding, apply additional coat(s) to achieve complete hiding without change in contract price.

I. Apply two coats of primer or sealer to surfaces of wood doors, including top and bottom edges, which are cut.

J. Sand wood and metal surfaces lightly between coats to achieve required finish.

K. Back prime and seal ends of exterior woodwork and edges of exterior plywood specified to be finished.

3.04 INTERIOR WALL AND CEILING JOINTS

A. Sealant-Type Expansion Joints in Gypsum Wallboard:
   1. Ensure that backer rod and joint sealant (specified in Division 7) are completed and cured prior to application of paint.

B. Fillet Joints between Hollow Metal Door Frames and Adjacent Walls (and similar locations):
   1. Ensure that backer rod and joint sealant (specified in Division 7) are completed and cured prior to application of paint.

3.05 REPAIR AND RESTORATION

A. Reinstall electrical plates, hardware, light fixture trim, escutcheons, and fittings that were removed prior to preparing surfaces or finishing.

B. Restore to original condition surfaces damaged or marred by painting materials application.

C. Remove, refinish, or repaint work not complying with approved samples and other specified requirements.

3.06 PROTECTION AND CLEANING

A. Collect waste material which may constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.07 SCHEDULE - SURFACES TO BE FINISHED

A. Gloss: Paints applied to the following substrates shall have the gloss levels indicated, unless noted otherwise:
   1. Interior and Exterior Steel Doors and Frames: Semi-gloss.
   2. Gypsum Board Ceilings: Flat.
   3. Interior Walls: Satin.
   4. Interior and Exterior Miscellaneous trim, hardboard, handrails, etc.: Semi-gloss.

B. Do Not Paint or Finish the Following Items:
   1. Items fully factory-finished unless specifically noted.
   2. UL, FMG, or other code required labels; fire rating labels; and equipment name, identification, performance rating, serial number and capacity labels.
   3. Stainless steel items.

C. Paint the surfaces described in Schedules at the end of this Section and as follows:
   1. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with primer only.
   2. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
   3. Finish exterior field-finished doors on tops, bottoms, and side edges the same as exterior faces.
   4. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.
   5. Paint both sides and edges of plywood panel backers for electrical and telephone equipment before installing equipment.

D. Mechanical and Electrical: Use paint systems defined for the substrates to be finished.
   1. Paint all insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment occurring in finished areas to match background surfaces, unless otherwise indicated.
   2. Paint shop-primed items occurring in finished areas.
   3. Paint interior surfaces of air ducts and convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.

3.08 EXTERIOR PRIMERS

A. Exterior Acrylic Galvanized Metal Primer:

1. Benjamin Moore & Co.; M04 IMC Acrylic Metal Primer.
2. PPG Architectural Finishes, Inc.; 6-209 Speedhide Galvanized Metal Primer.
3. The Sherwin-Williams Co.; B50WZ30 Galvite HS Metal Primer.

B. Exterior Acrylic Primer for Gypsum Board Soffit:
1. Benjamin Moore & Co.; 169 Moorcraft Super Spec Acrylic Latex Exterior Primer.
2. PPG Architectural Finishes, Inc.; 6-603 Speedhide Acrylic Int/Ext Alkali Resistant Latex Primer.
3. The Sherwin-Williams Co.; A-100 Exterior Latex Primer.

C. Exterior Acrylic Primer for Wood:
1. Benjamin Moore & Co.; 169 Moorcraft Super Spec Acrylic Latex Exterior Primer.
2. PPG Architectural Finishes, Inc.; 6-609 Speedhide Acrylic Latex Wood Primer.
3. The Sherwin-Williams Co.; A-100 Exterior Latex Primer.

3.09 EXTERIOR FINISH COATS

A. Semi-Gloss Acrylic Finish Coats for Concrete, Stucco, Concrete Masonry Units, Gypsum Soffit Board, Wood, Hardboard Siding:
1. Benjamin Moore & Co.; 170 Moorcraft Super Spec Latex House and Trim Paint, Semi-Gloss.
2. PPG Architectural Finishes, Inc.; 6-900 Speedhide Exterior Acrylic Latex Semi-Gloss House & Trim Paint.
3. The Sherwin Williams Co.; B66-200 Series DTM Acrylic Coating, Semi-Gloss.

B. Gloss Alkyd Finish Coats for Ferrous and Galvanized Metals:
1. Benjamin Moore & Co.; C133 Impervo Alkyd High Gloss Metal & Wood Enamel.
2. PPG Architectural Finishes, Inc.; 7-282 Series Int/Ext Industrial Gloss Oil Enamel.
3. The Sherwin-Williams Co.; B54Z-400 Series Industrial Enamel HS.

3.10 INTERIOR PRIMERS, SEALERS, AND FILLERS

A. Interior Acrylic Primer for Gypsum Board:
1. Benjamin Moore & Co.; 231 EcoSpec Interior Latex Primer Sealer. (0 g/l)
2. PPG Architectural Finishes, Inc.; 9-900 Pure Performance Interior Latex Primer. (0 g/l)
3. The Sherwin-Williams Co.; B11W900 Harmony Interior Latex Primer. (0 g/l)

B. Interior Acrylic Primer for Ferrous Metal:
1. Benjamin Moore & Co.; M04 IMC Acrylic Metal Primer. (54 g/l)
2. PPG Architectural Finishes, Inc.; 90-712 Pitt-Tech Primer/Finish DTM Industrial Enamel. (116 g/l)
3. The Sherwin-Williams Co.; B66W1 Direct To Metal Acrylic Primer & Finish. (138 g/l)

C. Interior Acrylic Primer for Galvanized Metal:
1. Benjamin Moore & Co.; M04 IMC. Acrylic Metal Primer. (54 g/l)
2. PPG Architectural Finishes, Inc.; 90-712 Pitt-Tech Primer/Finish DTM Industrial Enamel. (116 g/l)
3. The Sherwin-Williams Co.; B66W1 DTM Primer/Finish. (138 g/l)

D. Interior Acrylic Primer for Wood:
1. Benjamin Moore & Co.; 231 Eco Spec Interior Latex Primer Sealer. (0 g/l)
2. PPG Architectural Finishes, Inc.; 17-921 Seal-Grip Acrylic Latex Stain Blocking Primer. (96 g/l)
3. The Sherwin-Williams Co.; B11W900 Harmony Interior Latex Primer. (0 g/l)

3.11 INTERIOR FINISH COATS

A. Flat Acrylic Finish Coats for Concrete, Plaster, Concrete Masonry Units, Gypsum Board, Wood:
   1. Benjamin Moore & Co.; 219 Eco Spec Interior Latex Flat. (0 g/l)
   2. PPG Architectural Finishes, Inc.; 9-100 Pure Performance Flat Interior Latex. (0 g/l)
   3. The Sherwin-Williams Co.; B5 Series Harmony Interior Latex Flat Wall Paint. (0 g/l)

B. Eggshell Acrylic Finish Coats for Concrete, Plaster, Concrete Masonry Units, Gypsum Board, Wood:
   1. Benjamin Moore & Co.; 223 Eco Spec Interior Latex Eggshell Enamel. (0 g/l)
   2. PPG Architectural Finishes, Inc.; 9-300 Series Pure Performance Interior Eggshell Latex. (0 g/l)
   3. The Sherwin-Williams Co.; B9 Series Harmony Latex Eg-Shel (0 g/l).

C. Semi-Gloss Acrylic Finish Coats for Concrete, Plaster, Concrete Masonry Units, Gypsum Board, Wood:
   1. Benjamin Moore & Co.; 224 Eco Spec Interior Latex Semi-Gloss Enamel. (0 g/l)
   2. PPG Architectural Finishes, Inc.; 9-500 Series Pure Performance Interior Semi-Gloss Latex. (0 g/l)
   3. The Sherwin Williams Co.; B10 Series Harmony Interior Latex Semi-Gloss. (0 g/l)

D. Semi-Gloss Acrylic Finish Coats for Ferrous Metal:
   1. Benjamin Moore & Co.; IMC M29 DTM Acrylic Semi-Gloss Enamel. (207 g/l)
   2. PPG Architectural Finishes, Inc.; 90-474 Pitt-Tech Int/Ext Satin DTM Industrial Enamel. (227 g/l)
   3. The Sherwin-Williams Co.; B66-200 Series DTM Acrylic Coating, Semi Gloss. (208 g/l)

E. Semi-Gloss Acrylic Finish Coats for Galvanized Metal:
   1. Benjamin Moore & Co.; IMC M29 DTM Acrylic Semi-Gloss Enamel. (207 g/l)
   2. PPG Architectural Finishes, Inc.; 90-474 Pitt-Tech Int/Ext Satin DTM Industrial Enamel. (227 g/l)
   3. The Sherwin-Williams Co.; B66-200 DTM Series Acrylic Coating, Semi Gloss. (208 g/l)

3.12 INTERIOR PRIMERS, SEALERS, AND FILLERS

A. Interior Acrylic Primer for Gypsum Board:
   1. Benjamin Moore & Co.; 253 Moorcraft Super Spec Acrylic Latex Undercoater & Primer Sealer.
   2. PPG Architectural Finishes, Inc.; 5-2 Speedcraft Latex Primer Sealer.
   3. The Sherwin-Williams Co.; B28W200 PrepRite 200 Interior Latex Primer.

B. Interior Alkyd Ferrous Metal Primer:
   1. Benjamin Moore & Co.; C163 IronClad Alkyd Low Lustre Metal & Wood Primer.
   2. PPG Architectural Finishes, Inc.; 6-212 Speedhide Rust Inhibitive Steel Primer.
   3. The Sherwin-Williams Co.; Kem Kromik Universal Metal Primer.

C. Interior Acrylic Primer for Galvanized Metal:
   1. Benjamin Moore & Co.; M04 IMC Acrylic Metal Primer.
   2. PPG Architectural Finishes, Inc.; 90-712 Pitt-Tech Primer/Finish DTM Industrial Enamel.
   3. The Sherwin-Williams Co.; B66W1 DTM Acrylic Primer/Finish.

D. Interior Alkyd Primer for Wood and Trim:
   1. Benjamin Moore & Co.; C245 Moorcraft Super Spec Alkyd Enamel Undercoater & Primer Sealer.

2. PPG Architectural Finishes, Inc.; 6-6 Speedhide Alkyd Quick Dry Enamel Undercoater.
3. The Sherwin-Williams Co.; B49W2 PrepRite Wall and Wood Interior Oil Primer/Undercoater.

3.13 PAINT SYSTEMS - EXTERIOR

A. Galvanized Metal:
   1. First Coat: Acrylic galvanized metal primer.
   2. Two Top Coats: Gloss alkyd finish.

B. Gypsum Soffit Board:
   1. First Coat: Acrylic primer.
   2. Two Top Coats: Semi-gloss acrylic finish.

C. Wood and Hardboard Siding:
   1. First Coat: Acrylic primer.
   2. Two Top Coats: Semi-gloss acrylic finish.

3.14 PAINT SYSTEMS - INTERIOR

A. Ferrous Metals:
   1. First Coat: Primer.
   2. Two Top Coats: Semi-gloss acrylic finish.

B. Galvanized Metal:
   1. First Coat: Acrylic primer.
   2. Two Top Coats: Semi-gloss acrylic finish.

C. Gypsum Board:
   1. First Coat: Acrylic primer.
   2. Two Top Coats: Eggshell acrylic enamel finish.

D. Gypsum Board Ceilings:
   1. First Coat: Acrylic primer.
   2. Two Top Coats: Flat latex paint finish.

E. Wood Trim, and Panel Backers, Painted:
   1. First Coat: Primer.
   2. Two Top Coats: Eggshell acrylic finish.

END OF SECTION

SECTION 09 9600
HIGH PERFORMANCE COATINGS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Surface preparation.
   2. Application of primers, intermediate coats, and top coats for each coating system.

B. Coating Systems Include:
   09 9600.GFMGloss Fluoro-urethane Metal Finish

1.02 REFERENCES

A. Steel Structures Painting Manual, Vol. 2, 7th Edition; Systems and Specifications; Steel Structures Painting Council (SSPC); 1995.

1.03 SUBMITTALS

A. Product Data: Manufacturer's technical data sheets for each coating.
   1. Material analysis including vehicle type and percentage by weight and by volume of vehicle, resin, and pigment.
   2. Application instructions including mixing, surface preparation, compatible primers and topcoats, recommended wet and dry film thickness, recommended application methods.

B. Color and Texture Samples:
   1. Provide for each coating system, color, and texture and applied to representative substrate samples.
   2. Label each sample with coating name and color.
   3. Prepare samples to show bare, prepared surface and each successive coat.

1.04 QUALITY ASSURANCE

A. Installer: A company skilled in the application of special coatings whose installations have performed in a satisfactory manner under comparable conditions.

B. Coordination with Work Specified in Other Sections: Where primers will be applied in the shop, apply the primers listed in the schedule at the end of this section.
   1. Exception: Shop primed steel doors and frames shall receive fabricator's standard shop primer, followed by one full field coat of the primer specified in the schedule at the end of this section.

C. Mock-up:
   1. Apply coatings to mock-ups in the presence of the coating manufacturer's technical representative.
   2. Metals: Mock up one element of each coating system and color. Apply to mock up specified in the respective fabrication section, or if no mock up is specified therein, apply to an on-site mock-up as directed by the Architect.
   3. Apply full coating systems, including required textures and colors, to mock-up. In interior spaces, provide completed lighting, or similar, for viewing of mock-up.
   4. Remove and reapply coatings until texture, color, and gloss are approved by the Architect.
   5. Final approval of colors will be based on mock-up; obtain full job quantities of tinted materials only after obtaining final approval.
   6. Apply coatings to mock-ups in locations as directed by the Architect.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original containers bearing coating name and color, material composition data, date of manufacture, legal notices if applicable, and mixing, thinning, and application instructions.

B. Storage:
   1. Store materials in an orderly fashion and in clean, well-closed containers with labels intact.
   2. Maintain above 40 degrees F. Do not allow materials to freeze.

1.06 PROJECT CONDITIONS

A. Apply coatings only under the following environmental conditions:
   1. Air and surface temperatures are between 50 and 120 degrees F, or more restrictive when recommended by coatings manufacturer.
   2. Surface temperature is at least 5 degrees F above dew point, or more restrictive when recommended by coatings manufacturer.
   3. Relative humidity is less than 85 percent, or more restrictive when recommended by coatings manufacturer.

B. Do not apply coatings during inclement weather except within enclosed, conditioned spaces.

C. Provide temporary lighting to achieve a well-lit surface with a level of not less than 80 footcandles measured mid-height.

D. Provide continuous ventilation and heating to prevent accumulation of hazardous fumes, and maintain surface and ambient temperatures as specified above for 24 hours before, during, and for 48 hours after application of finishes (or longer if required to obtain full cure as indicated by manufacturer's instructions).

1.07 MAINTENANCE STOCK

A. At time of completing application, deliver stock of maintenance material to the Owner.

B. Furnish not less than one properly labeled and sealed gallon can of each type of finish coat of each color, taken from batch mix furnished for the work.

PART 2 PRODUCTS

2.01 SUBSTITUTIONS

A. Refer to Section 01 6000 - Product Requirements.

2.02 MANUFACTURERS

A. Provide all products of this section from a single manufacturer.

B. The brand-name products listed in the schedule at the end of this section and made by the following are the basis of the contract documents.
   1. Carboline.

C. Provide the products listed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and conditions are ready for work in accordance with the contract documents and coating manufacturer's recommendations.

B. Prior to commencement of work, examine surfaces scheduled to be finished.
   1. Report any unsatisfactory conditions in writing.
   2. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to the applicator.

3. Beginning work on an area will be deemed acceptance of surfaces in that area.

3.02 PREPARATION

A. Do not apply coatings to labels that identify equipment, fire-resistance ratings, etc.

B. Remove hardware, switch and outlet plates, lighting fixtures, etc., before applying coatings. After application of coatings, reinstall removed items. Employ only skilled workmen for removal and replacement of such items.

C. Provide protection for non-removable items not scheduled for coating.

D. Protect surfaces not scheduled for coating. Clean, repair, or replace to the satisfaction of the Architect any surfaces inadvertently spattered or coated.

3.03 SURFACE PREPARATION

A. General: Clean and prepare surfaces as specified. Achieve the surface profile recommended by the coating manufacturer for optimum adhesion and proper appearance.

B. All Surfaces: Ensure surfaces are clean, dry and free of oil, grease and other contaminants.

C. Ferrous Metal:
1. Clean and prepare surface profile in accordance with applicable SSPC specifications:
   a. Interior metal: SSPC-SP 2 Hand Tool Cleaning, SSPC-SP 3 Power Tool Cleaning.
   b. Exterior metal: SSPC-SP 6 Commercial Blast Cleaning,
   c. Exterior metal (field touch-up): SSPC-SP 11 Power Tool Cleaning to Bare Metal.
   d. Intricate fabricated shapes may be pickled (SSPC-SP 8) in lieu of blast cleaning when approved by the Architect.
2. Before hand or power tool cleaning, remove visible oil, grease, soluble welding residue, and salts by SSPC-SP 1 Solvent Cleaning. After hand or power tool cleaning, reclean surfaces if necessary.
3. Where commercial, near-white, or white metal abrasive blast cleaning is employed, apply first coat before rust-back occurs. Do not allow prepared surfaces to sit overnight without coating.
4. Before touching up coatings damaged by handling or welding, re-prepare damaged surfaces to original specification.
   a. Where abrasive blast cleaning or pickling was used for original preparation, either blast clean to original specification or prepare surface to SSPC-SP 11 Power Tool Cleaning to Bare Metal.

D. Nonferrous Metal: Solvent clean new surfaces in accordance with SSPC-SP 1 Solvent Cleaning specifications. If recommended by coating manufacturer to ensure adhesion, brush off blast clean in accordance with SSPC-SP 7. Prepare and prime any rusted existing surfaces in accordance with coating manufacturer's instructions.

3.04 MIXING AND THINNING

A. Remove and discard any skin formed on surface of coatings in containers. Discard any containers where skin comprises 2 percent or more of the remaining material.

B. Combine multi-component paints in quantities needed for use within the manufacturer's recommended pot life at the anticipated application temperatures. Discard remaining mixed material after pot life has expired.

C. Do not add thinner except as specifically recommended (not merely permitted) by the coating manufacturer for proper coating application under the circumstances prevailing at the project site when application equipment recommended by the coating manufacturer is employed. Use only the quantities and the types of thinner recommended.

D. Mix materials using mechanical mixers in accordance with coating manufacturer's instructions. Agitate mixed materials during application if recommended by manufacturer.

E. Strain pigmented coatings after mixing except where mechanical application equipment is provided with effective strainers.

3.05 APPLICATION

A. General:
   1. Metal Surfaces Exposed to View: Apply coatings using brush or spray, only. Roller application not permitted.
   2. Full, uniform coverage is required.
   3. Employ only application equipment that is clean, properly adjusted, in good working order, and of the type recommended by the coating manufacturer.
   4. Apply successive coats after adequate cure of the preceding coat and within the recommended recoating time.

B. Film Thickness: Apply each coat to achieve the dry film mil (DFM) thickness per coat indicated in the schedule at the end of this section. Application rates of excess thickness and fewer numbers of coats than specified will not be accepted.
   1. The dry film mil thicknesses shown in the schedule are per each coat.
   2. Where a thickness range is specified, the dry film thickness actually applied shall fall within the specified range when measured at any point, and the average dry film thickness actually applied to the entire surface shall be equal to the midpoint of the range specified plus or minus 10 percent.
   3. Where a single thickness value is specified, the dry film thickness actually applied, when measured at any point, shall be equal to the specified value plus or minus 10 percent.

C. Prime, First, or Bottom Coats:
   1. Ferrous and Nonferrous Surfaces:
      a. Unless specifically indicated otherwise (in this section or in the respective metal section of the Specification), the first coat of material may be either shop or field applied.
      b. Shop or field applied coatings, including primers, intermediate coats, and finish coats, shall be as specified in this section. Unless specifically indicated otherwise, fabricator's standard shop coats will not be accepted, and if applied, shall be removed, the surface prepared anew, and the coatings specified herein applied.
      c. Where fabricator's standard shop primer is permitted to remain (e.g. steel doors and frames), apply one full field coat of the primer specified in this section.
      d. Ferrous metals that have not been shop primed shall be field primed promptly after arrival at the site or shall be stored away from the effects of weather.
   2. Either before or after applying prime coat but before applying successive coats, stripe paint edges, corners, mechanical fasteners, and welds using specified primer.
   3. Before applying successive coats, touch-up connections, fasteners, and damaged areas using specified primer.
   4. Where first coat shows signs of suction spots or poorly sealed areas, reapply first coat material to adequately seal surface before proceeding with intermediate and top coats.

D. Miscellaneous:
   1. Completed coatings shall be free of defects such as runs, sags, lap or brush marks, holidays, and skips.

2. Apply coatings according to the schedule at the end of this section and as otherwise indicated. Coat all similar surfaces not specifically mentioned unless specifically exempted.

E. Apply coatings to match approved mock-ups.

F. Remove coatings not in compliance with this specification, reclean and re-prepare surfaces as specified, and apply coatings to comply with the contract documents.

3.06 CLEANING

A. Clean work area on a daily basis; dispose of spent materials and empty containers. If requested, turn over to the Architect all empty coatings containers used during the course of each day.

B. Remove all trace of coatings inadvertently applied to adjacent surfaces not scheduled to be coated. Remove by appropriate methods that do not damage surfaces.

3.07 DEMONSTRATION AND INSTRUCTION

A. Instruct Owner's personnel in methods of touch up painting of interior epoxy coatings.

3.08 PROTECTION

A. Protect work against damage until fully cured. Provide signs identifying wet surfaces until surfaces are adequately cured.

B. Shortly before final completion of the project, examine surfaces for damage to coatings and restore coatings to new, undamaged condition.

1. Touch-up of minor damage will be acceptable where, in the opinion of the Architect, the result is not visibly different from surrounding surfaces. Recoat entire surface where result is different either in color, sheen, or texture.

3.09 SCHEDULE

A. PRIMER, INTERMEDIATE, AND TOP COAT COLORS

1. Except where coating materials cannot be tinted, tint each successive (primer, intermediate, top) coat of paint a sufficiently contrasting color to facilitate identification of complete coating coverage. The preceding coat may be in the same color family, but shall be noticeably different. Provide additional top coats without change in Contract Price if necessary to achieve complete hiding and uniform sheen.
2. Top coat colors are indicated on the drawings and schedules. For approval of actual colors, see sample and mock-up requirements specified above.
3. Top coat colors of manufacturers listed on the Finish Schedule (or elsewhere) indicate the required color, only, and do not indicate the required brand name product, which shall be as specified below.

B. FLUORO-URETHANE COATINGS ON METALS

1. System Description:
   a. Epoxy primer.
   b. Epoxy or urethane intermediate coat.
   c. Fluoro-urethane polymer top coat.
2. Carboline:
   a. Wash Primer for Non-Ferrous Metals: Galoseal WB Wash Primer, DFT 0.5 to 1.0 mils. (98 g/l)
   b. Primer: Carboguard 893SG, DFT 3.0 to 5.0 mils. (336 g/l)
   c. Intermediate Coat: Carbothane 133LH, DFT 3.0 to 5.0 mils. (324 g/l)
   d. Gloss Finish Coat: GFM material designation on Finish Schedule.

1) Carboxane 950 Gloss, DFT 2.0 to 3.0 mils. (420 g/l)

END OF SECTION

SECTION 10 1101
VISUAL DISPLAY BOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Factory Assembled Units:
   1. Markerboards.

1.02 REFERENCES

A. ASTM A 424 - Standard Specification for Steel, Sheet, for Porcelain Enameling; 2006.

1.03 SUBMITTALS

A. Product Data: Provide manufacturer's data on products specified.

B. Shop Drawings:
   1. Include types of units provided, location within each room, and size of each unit.
   2. Include dimensioned elevation drawings of each board assembly indicating joint locations and type of joint where required, and board mounting distances from floors.
   3. Include cross-section details showing each type of product and components; trim, marker/chalk tray, face, core, backing materials and thickness, and key to elevations.
   4. Show locations and quantities of accessories.
   5. Show anchorage and installation details.

C. Selection Samples: Submit manufacturer's complete set of color samples for each product specified.

D. Verification Samples: Submit two samples 2 by 2 inches in size illustrating materials, finish, color, and texture of each product specified.

E. Manufacturer's printed installation instructions.

F. Maintenance Data: Manufacturer's cleaning and maintenance instructions covering both routine and long-term operations.

G. Warranty: Executed copy of manufacturer's warranty.

1.04 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain visual display boards of each type from a single source.

1.05 WARRANTY

A. Provide lifetime warranty for porcelain enamel steel markerboard and chalkboard writing surfaces when installed in accordance with manufacturer's instructions.

B. Warranty shall cover replacement of defective boards due to discoloration, excessive fading color, crazing, cracking or flaking. Warranty does not cover the cost of removal or reinstallation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Claridge Products: www.claridgeproducts.com.

B. Platinum Visual Systems: www.pvsusa.com.

C. Polyvision Corporation: www.polyvision.com.

2.02 MATERIALS

A. Writing Surface: ASTM A 424, Type I, Porcelain enamel on steel.

1. Metal Face Sheet Thickness: 0.024 inch (24 gage).
2. Hardboard Face Sheet Thickness: 1/4 inch.

B. Core:
1. Single Unit Core: Particleboard laminated to face sheet.
2. Spliced Unit Core: MDF laminated to face sheet.
3. Backing: 0.005 inch thick aluminum foil, laminated to core.

C. Frame: T5 tempered 6063 alloy extruded aluminum, with concealed fasteners.

D. Accessories:
1. Continuous chalk/marker tray with end caps.
2. One dry erase marker kit, for every 12 lineal feet of marker board, consisting of 3 different colored markers, 1 eraser, and 8 ounces of cleaning fluid.

2.03 FACTORY ASSEMBLED UNITS

A. Factory-assembled units in a single frame, of materials specified above.
1. Join panels of different construction with H-shaped extruded aluminum molding finished to match frame.
2. Join panels of similar construction with butt joints, aligned and secured with steel spline concealed in edge of core.
3. Configuration: As indicated on drawings.

B. Products:
1. Claridge Products: Series 4.
a. Markerboard: Gloss finish; Color 32 White .
2. Platinum Visual Systems: DTS.
a. Markerboard: Gloss finish; Color 454 Bright White.
3. Polyvision: 110 Series.
a. Markerboard: Gloss finish; Color 6100H White.

2.04 FACTORY ASSEMBLED UNIT FABRICATION

A. Laminate facing sheet and backing sheet to core material under pressure, using manufacturer's recommended adhesive.

B. Where butt jointed spliced panels are required use MDF core.

C. Provide factory-assembled visual display boards, except where sizes demand partial field assembly.

D. Assemble units in one piece without joints, wherever possible. Where required dimensions exceed maximum panel size available, provide two or more pieces of equal length, as indicated on approved shop drawings. Assemble to verify fit at factory, then disassemble for delivery and final assembly at project site.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated on drawings.

B. Verify that internal wall blocking is ready to receive work and positioning dimensions are as instructed by manufacturer.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Secure units level and plumb.

C. Butt Joints: Install with tight hairline joints.

3.03 CLEANING

A. Clean board surfaces in accordance with manufacturer's instructions.

B. Cover with protective cover, taped to frame.

C. Remove temporary protective cover at date of Substantial Completion.

END OF SECTION

SECTION 10 1400
SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cash allowance for signs.

B. Room and door signs.

1.02 PRICE AND PAYMENT PROCEDURES

A. See Section 01 2100 - Allowances, for cash allowances affecting this section.

B. Room and door signs are not covered by the allowance.

C. Allowance amount covers purchase and delivery but not installation.

1.03 REFERENCE STANDARDS

A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2003.

B. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines; 2002.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.

C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.

1. When room numbers to appear on signs differ from those on the drawings, include the drawing room number on schedule.
2. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
3. Submit for approval by Owner through Architect prior to fabrication.

D. Samples: Submit two samples of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.

E. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.

F. Verification Samples: Submit samples showing colors specified.

G. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Package signs as required to prevent damage before installation.

B. Package room and door signs in sequential order of installation, labeled by floor or building.

C. Store tape adhesive at normal room temperature.

1.06 FIELD CONDITIONS

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Flat Signs:
   1. Best Sign Systems, Inc: www.bestsigns.com.
   2. Mohawk Sign Systems, Inc: www.mohawksign.com.
   3. Seton Identification Products: www.seton.com/aec.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 SIGNAGE APPLICATIONS

A. Accessibility Compliance: All signs are required to comply with ADAAG and ANSI/ICC A 117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.

B. Room and Door Signs: Provide a sign for every doorway, whether it has a door or not, not including corridors, lobbies, and similar open areas.
   1. Sign Type: Flat signs with engraved panel media as specified.
   2. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.
   3. Character Height: 1 inch.
   4. Sign Height: 2 inches, unless otherwise indicated.
   5. Office Doors: Identify with room numbers to be determined later, not the numbers shown on the drawings ; in addition, provide "window" section for replaceable occupant name.
   6. Conference and Meeting Rooms: Identify with room numbers to be determined later, not the numbers shown on the drawings ; in addition, provide "window" section with sliding "In Use/Vacant" indicator.
   7. Service Rooms: Identify with room names and numbers to be determined later, not those shown on the drawings.
   8. Rest Rooms: Identify with pictograms, the names "MEN" and "WOMEN", room numbers to be determined later, and braille.

2.03 SIGN TYPES

A. Flat Signs: Signage media in aluminum frame.
   1. Corners: Square.
   2. Frame Finish: Natural (clear) anodized.
   3. Wall Mounting of One-Sided Signs: Tape adhesive.

B. Color and Font: Unless otherwise indicated:
   1. Character Font: Helvetica, Arial, or other sans serif font.
   2. Character Case: Upper case only.
   3. Background Color: As scheduled.
   4. Character Color: Silver Metallic color.

2.04 TACTILE SIGNAGE MEDIA

A. Engraved Panels: Laminated colored plastic; engraved through face to expose core as background color:
   1. Total Thickness: 1/16 inch.

B. Injection Molded Panels: One-piece acrylic plastic, with raised letters and braille.
   1. Total Thickness: 1/8 inch.

2.05 ACCESSORIES

A. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install neatly, with horizontal edges level.

C. Locate signs where indicated:
   1. Room and Door Signs: Locate on wall at latch side of door with centerline of sign at 60 inches above finished floor.
   2. If no location is indicated obtain Owner's instructions.

D. Protect from damage until Substantial Completion; repair or replace damage items.

END OF SECTION

SECTION 10 2113.16
PLASTIC-LAMINATE-CLAD TOILET COMPARTMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Plastic laminate toilet compartments.

1.02 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 1999.

B. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2003.

C. NEMA LD 3 - High-Pressure Decorative Laminates; National Electrical Manufacturers Association; 2005.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the work with placement of support framing and anchors in walls and ceilings.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.

C. Product Data: Provide data on panel construction, hardware, and accessories.

D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

PART 2 PRODUCTS

2.01 MATERIALS

A. Particleboard for Core: ANSI A208.1; composed of wood chips, sawdust or flakes, made with waterproof resin binder; of grade to suit application; sanded faces.

B. Plastic Laminate: NEMA LD 3, HGS.

2.02 COMPONENTS

A. Toilet Compartments: Plastic laminate finished, floor-mounted headrail-braced.

B. Doors, Panels, and Pilasters: Plastic laminate adhesive and pressure bonded to faces and edges of particleboard core, with beveled corners and edges; edges of cut-outs sealed.

1. Reinforce pilasters and panels with steel plate sandwiched in particleboard core at attachment points. Router cut openings as required.
2. Plastic Laminate Color: To match existing, textured, low gloss finish.

C. Door and Panel Dimensions:

1. Thickness: 1 inch.
2. Door Width: 24 inch.
3. Door Width for Handicapped Use: 36 inch , out-swinging.
4. Height: 58 inch.
5. Thickness of Pilasters: 1-1/4 inch.

2.03 ACCESSORIES

A. Pilaster Shoes: Formed chromed steel with polished finish, 3 inches high, concealing floor fastenings.

1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.

B. Head Rails: Hollow chrome plated steel tube, 1 x 1-5/8 inch size, with anti-grip strips and cast socket wall brackets.

C. Wall and Pilaster Brackets: Polished stainless steel.

D. Attachments, Screws, and Bolts: Stainless steel , tamper proof type.
1. For attaching panels and pilasters to brackets: Through-bolts and nuts ; tamper proof.

E. Steel Plate Reinforcement: Carbon steel, prepared for fasteners, 1/8 inch thick.

F. Hardware: Polished stainless steel:
1. Pivot hinges, gravity type, adjustable for door close positioning; two per door.
2. Thumb turn door latch with exterior emergency access feature.
3. Door strike and keeper with rubber bumper; mounted on pilaster in alignment with door latch.
4. Coat hook with rubber bumper; one per compartment, mounted on door.
5. Provide door pull for outswinging doors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify correct spacing of and between plumbing fixtures.

C. Verify correct location of built-in framing, anchorage, and bracing.

3.02 INSTALLATION

A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.

B. Maintain 3/8 to 1/2 inch space between wall and panels and between wall and end pilasters.

C. Attach panel brackets securely to walls using anchor devices.

D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.

E. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

3.03 TOLERANCES

A. Maximum Variation From True Position: 1/4 inch.

B. Maximum Variation From Plumb: 1/8 inch.

3.04 ADJUSTING

A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.

B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.

C. Adjust adjacent components for consistency of line or plane.

END OF SECTION

SECTION 10 2800
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Accessories for toilet rooms.

B. Grab bars.

1.02 REFERENCE STANDARDS

A. ASTM A 269 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2008.

B. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2003.

1.03 SUBMITTALS

A. Product Data: Provide data on accessories describing size, finish, details of function, attachment methods.

B. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS

2.01 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
   1. Grind welded joints smooth.
   2. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.

B. Stainless Steel Sheet: ASTM A 666, Type 304.

C. Stainless Steel Tubing: ASTM A 269, Type 304 or 316.

2.02 FINISHES

A. Stainless Steel: No. 4 satin brushed finish, unless otherwise noted.

2.03 TOILET ROOM ACCESSORIES

A. Toilet Paper Dispenser: Single roll, surface mounted bracket type, chrome-plated zinc alloy brackets , spindleless type for tension spring delivery designed to prevent theft of tissue roll.
   1. Attached Purse Shelf: 0.03 inch satin finished stainless steel, with rolled or formed edge at front.

B. Seat Cover Dispenser: Stainless steel, surface-mounted, reloading by concealed opening at base , tumbler lock.
   1. Minimum capacity: 250 seat covers , each side.

C. Grab Bars: Stainless steel, 1-1/4 inches outside diameter, minimum 0.05 inch wall thickness, nonslip grasping surface finish, concealed flange mounting; 1-1/2 inches clearance between wall and inside of grab bar.
   1. Length and configuration: As indicated on drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. Verify that field measurements are as indicated on drawings.

D. Verify installation of blocking, reinforced plates and consealed anchors

3.02 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights and Locations: As required by accessibility regulations, as indicated on drawings, and as follows:

END OF SECTION

SECTION 10 4400
FIRE EXTINGUISHERS, CABINETS AND ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

C. Accessories.

1.02 REFERENCES

A. UL 299 - Dry Chemical Fire Extinguisher; 2002.

B. Warnock Hersey, “Certification Listings.”

1.03 PERFORMANCE REQUIREMENTS

A. Provide extinguishers classified and labeled by testing firm acceptable to the authority having jurisdiction for the purpose specified and indicated.

1.04 SUBMITTALS

A. Product Data.

B. Maintenance Data: Include test, refill, or recharge schedules and re-certification requirements.

PART 2 PRODUCTS

2.01 SUBSTITUTIONS

A. Refer to Section 01 6000 - Product Requirements.

2.02 MANUFACTURERS

A. Fire Extinguishers, Cabinets and Accessories:
   1. JL Industries, Inc.: www.jlindustries.com.
   2. Larsen's Manufacturing Co.: www.larsensmfg.com.
   3. Potter-Roemer: www.potterroemer.com.

2.03 FIRE EXTINGUISHERS

A. Provide units complying with UL 299.

B. Dry Chemical Multi-Purpose Type: Steel cylinder.
   1. Size: 4A60BC.
   2. Diameter: 5 inches.
   3. Finish: Powder coat, red color.

2.04 CABINETS FOR DRY TYPE MULTI-PURPOSE FIRE EXTINGUISHERS

A. Style: Vertical Duo.

B. Trim: Flat, 1 inch-wide face.

C. Recessed Cabinet (non-fire-rated box):
   1. Exterior nominal dimensions of 9 to 10 1/2 inches wide x 24 inches high x 6 inches deep.
   2. Finish: Stainless Steel.
      a. J.L.; Cosmopolitan 1035.
      b. Larsen's; Architectural SS2409-R2.
      c. Potter-Roemer; Alta SS 7060 DV.

D. Door: 0.036 inch thick, reinforced for flatness and rigidity; latch. Hinge doors for 180 degree opening with continuous piano hinge. Provide nylon catch.

E. Door Glazing: Tempered Glass, clear, 1/8 inch thick float. Set in resilient channel gasket glazing.

F. Finish of Cabinet Interior: White enamel.

G. Cabinet Signage: FIRE EXTINGUISHER in black vertical letters parallel to vertical-duo window.

2.05 ACCESSORIES

A. Extinguisher Brackets: Formed steel, galvanized and enamel finished.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level, 34 inches from finished floor to inside bottom of cabinet.

C. Secure rigidly in place.

END OF SECTION

SECTION 10 7313
AWNINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum framing and fittings.

1.02 RELATED REQUIREMENTS

A. Section 09 9000 - Painting and Coating: Paint finish on framing members.

1.03 REFERENCE STANDARDS

A. ASTM A 123/A 123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2009.

B. ASTM A 500/A 500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2010.

C. ASTM A 501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2007.

D. ASTM B 210 - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes; 2004.

E. ASTM B 210M - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes (Metric); 2005.

1.04 DESIGN REQUIREMENTS

A. Awning materials, assembly and attachments to resist snow loads, positive and negative wind design loads of 20 lb/sq ft at any point without damage or permanent set.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on awning covering, color fastness, stitching and seaming methods, attachment devices to framing system.

C. Shop Drawings: Indicate awning profiles, sizes, connection attachments, anchorage, size and type of fasteners, accessories.

PART 2 PRODUCTS

2.01 ALUMINUM FRAMING SYSTEM

A. Framing: 1 1/2" inch square, tubing , conforming to ASTM B 210 (ASTM B 210M).

B. Fittings: Elbows, T-shapes, wall brackets; cast aluminum.

C. Mounting: Brackets and flanges, with aluminum inserts for embedding into masonry.

D. Splice Connectors: Concealed spigot; cast aluminum.

E. Exposed Fasteners: Flush countersunk galvanized steel screws or bolts; consistent with design of system.

F. Finish Exposed Components: Baked enamel to _____ color as selected.

2.02 COVERING MATERIALS

2.03 FABRICATION - FRAMING

A. Fit and shop assemble components in largest practical sizes, for delivery to site.

B. Fabricate components with joints tightly fitted and secured.

C. Exposed Fastenings: Unobtrusively located; consistent with design of component, except where specifically noted otherwise.

D. Supply components required for anchorage of framing. Fabricate anchors and related components of same material and finish as framing, except where specifically noted otherwise.

E. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

F. Accurately form components to suit each other and to building structure.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall substrate anchors are acceptable and are ready to receive work.

3.02 PREPARATION

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

3.03 INSTALLATION - FRAMING

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects.

C. Provide anchors required for connecting framing to structure. Anchor framing to structure.

D. Field weld anchors as indicated on drawings. Grind welds smooth. Touch-up welds with primer.

E. Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

3.04 INSTALLATION - COVERING

A. Install covering over framing members, stretched taut without creases or folds.

B. Attach covering and fasten securely.

3.05 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Misalignment From True Position: 1/4 inch.

END OF SECTION

SECTION 11 5213
PROJECTION SCREENS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Front projection screen assemblies.

1.02 RELATED REQUIREMENTS

A. Section 05 5000 - Metal Fabrications: Supports for suspended projection screens.

B. Section 06 1000 - Rough Carpentry: Wood blocking in walls and ceilings.

C. Section 09 2116 - Gypsum Board Assemblies: Suspended gypsum board ceilings for recessed screens, and openings in gypsum board partitions for fixed and rear projection screens.

D. Section 26 2717 - Equipment Wiring: Electrical supply, conduit, and wiring for electric motor operated projection screens.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

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

C. Shop Drawings: For custom installations, indicate dimensions, verified field measurements, mounting details, and interface with adjacent construction.

D. Operation and Maintenance Data: Provide manufacturer's operation and maintenance instructions.

E. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Experienced in manufacturing products specified in this section.

B. Installer Qualifications: Experienced in installation of the work of this section.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver projection screens to project site in manufacturer's original unopened packaging. Inspect for damage and size before accepting delivery.

B. Store in a protected, clean, dry area with temperature maintained above 50 degrees F. Stack according to manufacturer's recommendations.

C. Acclimate screens to building temperatures for 24 hours prior to installation, or in accordance with manufacturer's recommendations.

1.06 FIELD CONDITIONS

A. Maintain interior of building between 60 degrees F and 75 degrees F during and after installation of projection screens.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide 15 year manufacturer warranty for projection screen assembly.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Bretford: www.bretford.com.

B. Da-Lite Screen Company: www.da-lite.com.

C. Draper, Inc: www.draperinc.com.

2.02 FRONT PROJECTION SCREENS

A. Manufacturers:
   1. Bretford: www.bretford.com.
   2. Da-Lite Screen Company: www.da-lite.com.
   3. Draper, Inc: www.draperinc.com.

B. Front Projection Screens: Factory assembled unless otherwise indicated.
   1. In Meeting Room: Motorized, matte light diffusing fabric screen, horizontally tensioned , ceiling recessed.
      a. Screen Viewing Area: 87"H inches by 116" W inches.

C. Matte Light Diffusing Fabric: Light diffusing screen fabric; washable, flame retardant and mildew resistant.
   1. Material: Acoustically transparent matte white vinyl on fiberglass backing, with nominal gain of 1.0 over viewing angle not less than 70 degrees from axis, horizontally and vertically.
   2. Seams: No seams permitted in fabric up to 96 inches high by 72 inches wide.

D. Extra Drops: Black; 24 inches.

E. Concealed-in-Ceiling Screen Cases: Steel; integral roller brackets.
   1. Door Slat: Self trim; self-closing and -opening.
   2. Case Finish: Baked enamel.
   3. Case Color: White.
   4. End Caps: Steel; finished to match case.
   5. Electrically-Operated Screens: 1-1/2 inch aluminum door roller.

F. Electrically-Operated Screens:
   1. Roller: 2 inch aluminum, with locking device.
   2. Vertical Tensioning: Screen fabric weighted at bottom with steel bar with plastic end caps.

G. Provide mounting hardware, brackets, supports, fasteners, and other mounting accessories required for a complete installation, in accordance with manufacturer's recommendations for specified substrates and mountings.

2.03 ELECTRICAL COMPONENTS

A. Electrical Components: Listed and classified by UL as suitable for the purpose specified and indicated.

B. Motors: Direct drive, 110 V, 60 Hz.
   1. Screen Motor: Mounted inside roller; three wire with ground; quick reverse type; equipped with thermal overload cut-off.
      a. Electrical Characteristics: 1.2 amps.
      b. Motor mounted on sound absorber.
   2. Door and Adjustable Masking Motor: Mounted inside roller; three wire with ground; quick reverse type; equipped with thermal overload cut-off.

a. Electrical Characteristics: 1.2 amps.

C. Controls: 3 position control switch with plate.
1. Provide 2 control stations to screen, with internal override to prevent more than one signal reaching the screen.
2. In Meeting Room, provide control stations at front and rear of room.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate is finished and ready to accept screen installation.

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

C. Verify that openings for recessed screens are correctly sized.

D. Verify type and location of electrical connections.

E. Do not install projection screens until climate control systems are in place and interior painting and other finishes are completed.

3.02 PREPARATION

A. Coordinate screen installation with installation of projection systems.

B. Coordinate installation with adjacent construction and fixtures, including ceilings, walls, lighting, fire suppression, and registers and grilles.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions, using manufacturer's recommended hardware for relevant substrates.

B. Do not field cut screens.

C. Install screens in mountings as specified and as indicated on drawings.

D. Install plumb and level.

E. Install electrically operated screens ready for connection to power and control systems by others.

F. Adjust projection screens and related hardware in accordance with manufacturer's instructions for proper placement and operation.

G. Test electrical screens for proper working condition. Adjust as needed.

3.04 PROTECTION

A. Protect installed products until completion of project.

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

SECTION 12 2413
WINDOW SHADE SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manually-operated window shades and accessories.

1.02 SUBMITTALS

A. Product Data: Manufacturer's catalog data, product descriptions, installation instructions, detail sheets, and specifications for each type system specified.

B. Samples for Verification: Shade fabric sample and paint finish as selected.

C. Shop Drawings: Show dimensions and interface with other products.
   1. Room schedule including field-verified dimensions of each opening to receive window shade system.
   2. Indicate model number, operator, fabric selection, and mounting type.
   3. Indicate control type and provide zone schedule if necessary.

D. Maintenance Data: Methods for maintaining roller shades, precautions regarding cleaning materials and methods, and instructions for operating hardware and controls.

E. Roller Shade Schedule: Use same room designations as indicated on Drawings and include opening sizes and key to typical mounting details.

1.03 QUALITY ASSURANCE

A. Installer Qualifications: Installer trained and certified by the manufacturer with a minimum of ten years experience installing products comparable to those specified in this section.

B. Mock-up: Provide a mock-up of each window shade system for evaluation of mounting, appearance and accessories.
   1. Mock-up may remain as part of the work.
   2. Locate mock-up in window designated by Architect.
   3. Do not proceed with remaining work until, mock-up is accepted by Architect.

1.04 WARRANTY

A. Roller shade hardware, chain and shade fabric: Manufacturer's standard warranty.

1.05 PROJECT CONDITIONS

A. Environmental Limitations: Install roller shades after finish work, including painting, is complete and ambient temperature and humidity conditions are maintained at the levels indicated for project when occupied for its intended use.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to project site in manufacturer's original cartons.

B. Individually package and mark shades with room number and opening number.

C. Inspect the materials upon delivery to assure that specified products have been received.

D. Store and handle shades to prevent damage to fabrics, finishes, and operators prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Mechoshade: www.mechoshade.com.

B. Nysan: www.nysan.com.

C. Silent Gliss: www.silentgliss-usa.com.

2.02 SHADE SYSTEMS

2.03 MANUALLY OPERATED WINDOW SHADE SYSTEM

A. Products:
   1. Mechoshade; M/5 System.
   2. Nysan; Sunriser.
   3. Silent Gliss; 4810.

B. Chain Operation: Bi-directional wrap spring clutch shall allow for shade to stop and hold at any position.

C. Chain Operator Position: Right-hand side, unless otherwise noted on drawings.

D. Bead Chain: No. 10 stainless steel.

E. Clutch mechanism: Fabricated from high carbon steel.
   1. Components fabricated from styrene based plastics, polyester or reinforced polyester are not acceptable.

2.04 SHADE COMPONENTS

A. Rollers:
   1. Shade roller tube shall be extruded aluminum of diameter and wall thickness required to support shade fabric. Maximum allowable deflection L/700.
   2. Rollers shall be easy to remove from support brackets.

B. Mounting Brackets: Stamped steel, custom fabricated as required for mounting style indicated.

C. Hembar: Concealed.

2.05 ACCESSORIES

A. Finish for accessories, unless otherwise noted: Clear anodized aluminum.

B. Pocket: Extruded aluminum shall conceal mounting hardware, roller tube, and fabric rolled on tube.

2.06 SHADE FABRICATION

A. Shades mounted inside window frame: Window shade system shall completely fill opening from head to sill. Provide 1/4 inch clearance between each side of the shade and jamb, unless indicated otherwise.

B. Shade fabric shall hang flat without buckling or distortion and in the same direction.

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 contractor of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Verify that blocking and framing necessary to carry shade assembly hardware is properly installed and secure.

3.03 INSTALLATION

A. Install window shade systems level, plumb, square and true according to manufacturer's written instructions and these specifications.

B. Adjust and balance roller shades to operate smoothly, safely and free from binding or malfunction throughout entire operational range.

C. Clean roller shade surfaces after installation, according to manufacturer's written instructions.

D. Installer to train owner's maintenance personnel to adjust, operate and maintain roller shade systems.

3.04 PROTECTION

A. Protect installed products until completion of project.

END OF SECTION

SECTION 21 00 00

AUTOMATIC SPRINKLER SYSTEM

PART 1 - GENERAL

1.1 SYSTEM PERFORMANCE REQUIREMENTS

A. Design and obtain approval from authorities having jurisdiction for fire protection systems specified.

B. Conduct flow tests as required to obtain data needed to prepare design for calculated systems.

C. Design sprinkler systems according to the conditions shown on the drawings.

1.2 SUBMITTALS

A. Provide product data for fire protection system components. Include the following:
1. Valves.
2. Specialty valves, accessories, and devices.
3. Sprinklers, escutcheons, and guards. Include sprinkler flow characteristics, mounting, finish, and other data.

B. Sprinkler system drawings, identified as "working plans" and prepared in accordance with NFPA 13 Chapter 22 (2007), that have been approved by authorities having jurisdiction. Include system calculations where applicable.

C. Test reports and certificates as described in NFPA 13. Include "Contractor's Material & Test Certificate for Aboveground Piping" and "Contractor's Material & Test Certificate for Underground Piping."

D. Maintenance data for each type of fire protection specialty specified, for inclusion in "Operating and Maintenance Manual".

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firms whose equipment, specialties, and accessories are listed by product name and manufacturer in UL Fire Protection Equipment Directory and FM Approval Guide and that conform to other requirements indicated.

B. Comply with requirements of authorities having jurisdiction for submittals, approvals, materials, hose threads, installation, inspections, and testing.

C. Installer's Qualifications: Firms qualified to install and alter fire protection piping, equipment, specialties, and accessories, and repair and service equipment. A qualified firm is one that is experienced (minimum of 5 previous projects similar in size and scope to this Project) in such work, familiar with precautions required, and in compliance with the requirements of the authorities having jurisdiction . Submit evidence of qualifications to the Architect upon request.

D. NFPA Standards: Equipment, specialties, accessories, installation, and testing complying with the following:
1. NFPA 13 "Standard for the Installation of Sprinkler Systems."

E. Additional Quality Assurance Requirements: Georgia Fire Sprinkler Act, Rules of the State Fire Marshall, Certificate of Competency, NICET.

PART 2 - PRODUCTS

2.1 PIPES AND TUBES

A. Refer to Part 3 Article "Sprinkler System Piping Applications" for identification of systems where pipe and fitting materials specified below are used.

B. Ductile-Iron Pipe: AWWA C151, ductile-iron barrel with iron-alloy threaded flanges, 250-psig minimum working pressure rating, and AWWA C104 cement-mortar lining.
1. Option: Pipe may be AWWA pattern, cut-grooved for grooved-coupling joints.

C. Steel Pipe: ASTMA 53, Schedule 40, black and galvanized, plain and threaded ends, for welded, threaded, cut-groove, and rolled-groove joints.

D. Steel Pipe: ASTM A 795, black and galvanized, for joints listed and for use with fittings for plain-end steel pipe.
1. Type: Standard-weight pipe, Schedules 30 and 40, for cut-groove, rolled-groove, threaded, and welding joints.

2.2 PIPE AND TUBE FITTINGS

A. Pipe and fittings shall be listed by product name and manufacturer in UL Fire Protection Equipment Directory and FM Approval Guide and shall conform to other requirements indicated.

B. Cast-Iron Threaded Flanges: ASME B16.1, Class 250, raised ground face, bolt holes spot faced.

C. Ductile-Iron and Gray-Iron Flanged Fittings: AWWA C110, 250-psig (1725-kPa) minimum pressure rating, with AWWA C104 cement-mortar lining.

D. Cast-Iron Threaded Fittings: ASME B16.4, Class 250, standard pattern, with threads according to ASME B1.20.1.

E. Malleable-Iron Threaded Fittings: ASME B16.3, Class 300, standard pattern, with threads according to ASME B1.20.1.

F. Grooved-End Fittings for Ductile-Iron Pipe: ASTM A 536 ductile-iron or ASTM A 47 malleable-iron, AWWA pipe-size, designed to accept AWWA C606 grooved couplings. Include cement lining or Food and Drug Administration (FDA)-approved interior coating.

G. Steel Fittings: ASTM A 234 (ASTM A 234M), seamless or welded; ASME B16.9, buttwelding; or ASME B16.11, socket-welding type for welded joints.

H. Steel Flanges and Flanged Fittings: ASME B16.5.

I. Grooved-End Fittings for Steel Pipe: UL-listed and FM-approved, ASTM A 536, Grade 65-45-12 ductile iron or ASTM A 47 Grade 32510 malleable iron, with grooves or shoulders designed to accept grooved couplings.

2.3 JOINING MATERIALS

A. Flanged Joints for Ductile-Iron Pipe and Ductile-Iron or Cast-Iron Fittings: AWWA C115 ductile-iron or gray-iron pipe flanges, rubber gaskets, and high-strength steel bolts and nuts.

B. Brazing Filler Metals: AWS A5.8, Classification BCuP-3 or BCuP-4.

C. Couplings for Grooved-End Steel Pipe and Grooved-End Ferrous Fittings: UL 213, AWWA C606, ASTM A 536 ductile-iron or ASTM A 47 malleable-iron housing, with enamel finish. Include synthetic-rubber gasket with central-cavity, pressure-responsive design; ASTM A 183 carbon-steel bolts and nuts; and locking pin, toggle, or lugs to secure grooved pipe and fittings.

D. Couplings for Grooved-End Ductile-Iron Pipe and Fittings: UL 213, AWWA C606, ASTM A 536 ductile-iron housing, with enamel finish. Include synthetic-rubber gasket with central-cavity, pressure-responsive design, and ASTM A 183 carbon-steel bolts and nuts to secure grooved pipe and fittings.

2.4 FIRE PROTECTION SERVICE VALVES

A. General: UL-listed and FM-approved, with 175-psig non-shock minimum working pressure rating.
1. Option: Valves for use with grooved piping may be grooved type.

B. Gate Valves, 2 Inches and Smaller: UL 262, cast-bronze, threaded ends, solid wedge, outside screw and yoke, rising stem.

C. Indicating Valves, 2-1/2 Inches and Smaller: Butterfly or ball type, bronze body with threaded ends, and integral indicating device.
1. Indicator: Electrical 115 volts a.c., prewired, single-circuit, supervisory switch.

D. Gate Valves, 2-1/2 Inches and Larger: UL 262, iron body, bronze mounted, taper wedge, outside screw and yoke, rising stem. Include replaceable, bronze, wedge facing rings and flanged ends.

E. Gate Valves, 2-1/2 Inches and Larger for Use with Indicator Posts: UL 262, iron body, bronze mounted, solid wedge disc, non-rising stem with operating nut and flanged ends.

F. Swing Check Valves, 2-1/2 Inches and Larger: UL 312, cast-iron body and bolted cap, with bronze disc or cast-iron disc with bronze disc ring and flanged ends.

2.5 SPRINKLERS

A. Automatic Sprinklers: With heat-responsive element conforming to:
1. UL 199, for all applications.

B. Sprinkler types and categories are as indicated and as required by application. Furnish automatic sprinklers with nominal 1/2-inch orifice for "Ordinary" temperature classification rating except where otherwise indicated and required by application.

C. Sprinkler types, features, and options include:
1. Pendent sprinklers, semi or fully recessed, wet and dry type.
2. Sidewall sprinklers, wet and dry type.
3. Upright sprinklers.

D. Sprinkler Finishes: Chrome-plated, bronze, and painted.

E. Sprinkler Guards: Wire-cage type, including fastening device for attaching to sprinkler.

F. Sprinkler Cabinets: Finished steel cabinet and hinged cover, with space for minimum of 6 spare sprinklers plus sprinkler wrench, suitable for wall mounting. Include number of sprinklers

required by NFPA 13 and 1 wrench for sprinklers. Include separate cabinet with sprinklers and wrench for each style sprinkler on Project.

PART 3 - EXECUTION

3.1 SPRINKLER SYSTEM PIPING APPLICATIONS

A. Refer to Part 2 of this Section for detailed specifications on pipe and fittings products listed below. Use pipe, tube, fittings, and joining methods according to the following applications. Piping may be joined with flanges instead of indicated joints. Use grooved-end fittings with grooved couplings that are made by the same manufacturer and that comply with listing when used together for grooved-coupling joints.

B. Sizes 2 Inches and Smaller: ASTM A 53, A 135, or A 795; Schedule 40 steel pipe with threaded ends, cast-iron or malleable-iron threaded fittings, and threaded joints.

C. Sizes 2-1/2 Inches to 6 Inches : ASTM A 135 or A 795, Schedule 10 steel pipe with rolled-groove ends, grooved-end steel pipe fittings, and grooved-coupling joints.

D. Sizes 8 Inches and Larger: ASTM A 53 or A 795, Schedule 30 steel pipe with rolled-groove ends, steel pipe grooved-end fittings, grooved couplings, and grooved-coupling joints.

3.2 JOINT CONSTRUCTION

A. Grooved-End Pipe and Grooved-End Fitting Joints: Use grooved-end fittings and grooved couplings that are made by the same manufacturer and that are listed for use together. Groove pipe and assemble joints with grooved coupling, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.
1. Groove Type: Rolled.

3.3 PIPING INSTALLATIONS

A. Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate general location and arrangement of piping. Install piping as indicated, as far as practical.
1. Deviations from approved "working plans" for sprinkler piping require written approval from authority with jurisdiction. File written approval with the Architect prior to deviating from approved "working plans."

B. Use approved fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

C. Install "Inspector's Test Connections" in sprinkler piping, complete with shutoff valve, sized and located according to NFPA 13.

D. Install sprinkler piping with drains for complete system drainage.

E. Hangers and Supports: Comply with NFPA 13.
1. Install hanger and support spacing and locations for steel piping joined with grooved mechanical couplings according to manufacturer's written instructions for rigid systems.

3.4 VALVE INSTALLATIONS

A. Install fire-protection specialty valves, trim, fittings, controls, and specialties according to NFPA 13, manufacturer's written instructions, and the authority having jurisdiction.

B. Gate Valves: Install fire-protection service valves supervised-open, located to control sources of water supply except from fire department connections. Where there is more than 1 control valve, provide permanently marked identification signs indicating portion of system controlled by each valve.

3.5 SPRINKLER APPLICATIONS

A. Rooms with Ceilings: Pendent sprinklers matching existing type.

B. Wall Mounting: Sidewall sprinklers.

C. Sprinkler Finishes: Use sprinklers with following finishes:
1. Upright, Pendent, and Sidewall Sprinklers: Chrome-plated in finished spaces exposed to view; rough bronze in unfinished spaces not exposed to view.

3.6 SPRINKLER INSTALLATIONS

A. Install sprinklers in patterns indicated.

B. Install sprinklers in suspended ceilings in center of narrow dimension of acoustical panels.

3.7 CONNECTIONS

A. Electrical Connections: Power wiring is specified in Division 16.

B. Connect alarm devices to fire alarm system.

3.8 FIELD QUALITY CONTROL

A. Perform field acceptance tests of each fire protection system.
1. Flush, test, and inspect sprinkler piping systems according to NFPA 13 Chapter "System Acceptance."

B. Replace piping system components that do not pass test procedures specified, then retest to demonstrate compliance. Repeat procedure until satisfactory results are obtained.
1. Report test results promptly and in writing to Architect.
2. Report test results promptly and in writing to authority having jurisdiction when required.

3.9 CLEANING

A. Clean dirt and debris from sprinklers. Replace sprinklers having paint other than factory finish with new sprinklers. Cleaning and reuse of painted sprinklers is prohibited.

3.10 COMMISSIONING

A. Starting Procedures: Follow manufacturer's written procedures. If no procedures are prescribed by manufacturer, proceed as follows:
1. Verify that trim, fittings, controls, and accessories have been installed correctly and operate correctly.
2. Verify that specified tests of piping are complete.
3. Check that damaged sprinklers and sprinklers with paint or coating not specified have been replaced with new, correct type of sprinklers.
4. Check that sprinklers are correct type, have correct finish and temperature ratings, and have guards where required for applications.
5. Check that fire department connections have threads compatible with local fire department equipment and have correct pressure rating.

6. Fill sprinkler system with water.
7. Energize circuits to electrical equipment and devices.

B. Coordinate with fire alarm system tests. Operate systems as required.

END OF SECTION 21 0000

SECTION 22 05 00
PLUMBING GENERAL

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. The requirements specified herein shall apply to all Sections of Division 22.

B. Warranties:
1. The contractor shall warrant to the Owner that all work shall be free from defects and will conform to the contract documents. This warranty shall extend not less than one year from the date of beneficial occupancy.

C. The plans accompanying these specifications are generally diagrammatic and do not show all details required for the complete work. Establish details of the work as necessary to provide for the complete installation of systems and materials.

D. Coordinate the work to avoid conflicts with items such as ductwork, beams, fire barriers, ceiling types and heights, slab or wall thickness, cabinet heights, or door swings. Do not scale the plans for dimensions. Verify dimensions before starting work and report any discrepancy or interference to the Owner's representative for clarification.

1.2 QUALITY ASSURANCE

A. All mechanical work shall be in accordance with the following codes and agencies:
1. International Building Code, 2006 Edition, with latest Georgia Amendments
2. International Fuel Gas Code, 2006 Edition, with latest Georgia Amendments
3. International Mechanical Code, 2006 Edition, with latest Georgia Amendments
4. International Plumbing Code, 2006 Edition, with latest Georgia Amendments
5. ASHRAE 90.1 – 2007.
6. State and local ordinances governing mechanical work.

B. Where the requirements of the specifications or drawings exceed those of referenced codes, standards and regulations, the drawings or specifications shall govern.

C. Where UL listing is required, equipment and materials shall bear the UL label.

D. The manufacturer's names and catalog numbers are subject to compliance with requirements. Substitutes of equivalent materials and equipment may be submitted for consideration. Any proposed exceptions to requirements shall be clearly and fully stated in one place, including required related changes to building systems, operating procedures, and maintenance functions.

1.3 PERMITS AND FEES

A. Obtain all permits and inspections required for the work involved and pay all charges incident thereto related to:
1. Water.
2. Sewer.

B. Deliver to the Owner all certificates of inspection.

C. Pay charges related to all utility connections and coordinate with utility company.

1.4 SUBMITTALS

A. See Division 1 for additional submittal requirements.

B. Provide submittals to indicate compliance with requirements. Submittals shall include:
1. Specification paragraph.
2. Manufacturer and model number.
3. Schedule information.
4. Electrical characteristics.
5. Accessories and options.
6. Installation instructions.
7. Deviations from requirements.

C. Product information for the following items shall be submitted for review:
1. Equipment scheduled on the drawings.
2. Other items specifically indicated to be submitted for review in other Sections.

D. Record on one set of plans all changes and deviations from the contract plans. Record final location of equipment, piping, etc. Make sufficient measurements to locate major piping runs and show same on record plans as as-built conditions. Transfer changes and deviations to project drawings and deliver same to Owner's representative.

E. Submittals not specifically required, or not complying with the format requirements, will be returned unreviewed.

1.5 OPERATION AND MAINTENANCE INSTRUCTIONS

A. See Division 1 for additional requirements for Operation and Maintenance (O&M) instructions.

B. Provide a minimum of two sets of O&M Manuals. One copy of O&M information shall be submitted for review prior to delivery to the Owner. The manuals shall consist of printed material that shall, as a minimum, include:
1. Parts lists for individual components of each piece of equipment.
2. Manufacturer's name and address.
3. Location of local parts supplier.
4. Manufacturer's published operation and maintenance instructions.
5. Data sheets highlighting equipment designations and model numbers.

C. Each Manual shall be compiled as follows:
1. Data shall be bound in smooth surface hard back commercial quality three-ring notebooks with project identification shown on the front cover and binding back. Identification labels shall be typed.
2. Notebooks shall have 9-1/2-inch by 11-1/2-inch covers with back width to permit the covers to lie parallel or to converge.

3. Tabbed index divider sheets of heavy Manila paper shall be inserted between each section of the Manual for identification of Sections.
4. Data sheets and diagrams shall be 8-1/2-inch x 11-inch or be mounted on 8-1/2-inch x 11-inch sheets. Drawings and diagrams larger than 8-1/2-inch by 11-inch shall be folded up from the bottom to form a height of 11-inches and folded to the left to form a width of 8-1/2-inches

1.6 INSTRUCTION OF OWNER PERSONNEL

A. Prior to a request for final inspection, at a time designated by the Architect, instruct operating personnel designated by the Owner in operation and maintenance of the systems. The contractor shall give notice to the Architect not less than 30 days prior to the anticipated date of instruction to allow planning by the Owner.

B. The training shall consist of on-site training. Training shall include a review of the manufacturer's data sheets and O&M manuals. The contractor shall demonstrate, in the field, the sequence of operation of each piece of equipment and each system.

1.7 COMPLETION OF WORK

A. Incomplete Work: Prior to starting the inspection process at the semifinal or other inspections where work is inspected as being completed, the contractor shall give the Architect a list of work not completed, reason for incompletion, and date when said work will be completed.

B. Inspection: At final inspection the entire system shall be shown to be in specified working condition. The following shall be available during the inspection:
1. Contractor Representative.
2. Mechanic with hand tools.
3. Specified test data.
4. Certificates.
5. Complete Specifications and Drawings with all addenda and revisions.
6. Operating and Maintenance Manuals.
7. Contractor's Pre-Final Punch list indicating disposition of all items with initials of person confirming completion.

C. Uncovering of Concealed Work: Floor cleanouts shall be opened for inspection and then re-closed. Other concealed areas shall be opened upon request, where access is provided.

1.8 PRODUCT DELIVERY, STORAGE, HANDLING, AND PROTECTION

A. Provide a dry, weathertight space for storing materials. Store packaged materials in original shipping containers with manufacturer's labels and seals intact. Store equipment and material off the ground or floors exposed to rain.

B. Plug ends of pipes when work is stopped to prevent debris from entering pipes.

C. Equipment and materials shall not be installed until environmental conditions of the job site are suitable. Replace damaged materials.

1.9 CLEANING AND PAINTING

A. Remove oil, dirt, grease and foreign materials from all equipment to provide a clean surface. Touch-up scratched or marred surfaces of equipment enclosures with paint manufactured specifically for that purpose.

1.10 SEQUENCING AND SCHEDULING

A. Arrange for chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.

B. Coordinate the installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Unless indicated otherwise on the plans, equipment and materials shall be new.

B. Once a product line has been established, it shall be consistently maintained throughout the entire installation.

2.2 HANGERS AND SUPPORTS FOR PLUMBING SYSTEMS

A. Subject to compliance with requirements, pipe hangers and accessories shall be B-Line, Elcen, Michigan, or Grinnell.

B. Hangers:
1. Pipe hangers for steel and cast iron pipe shall be steel or malleable iron, unless indicated otherwise.
2. Hangers for steel pipes 2-1/2" and smaller shall be split ring type, adjustable swivel ring hangers; Elcen 92, Grinnell 104, or Michigan 111.
3. Copper piping hangers shall be copper plated. Hangers for copper piping 4" and smaller shall be copper-plated, Elcen 389, Grinnell CT-269, or Michigan 106.
4. Hangers for insulated lines shall be of sufficient size for pipe insulation protective shields to fit outside insulation.

C. Hanger rods:
1. Hangers shall be complete with rods and supports proportioned to the size of pipe to be supported.
2. Hanger rods shall be steel.
3. Hanger rod sizes for single pipes:

Pipe Size	Rod Diameter
2" and smaller	0.375"
2 ½" and 3"	0.5"

4. Sizes for multiple pipe hangers shall be calculated for the total weight of supported piping.

D. Pipe supports for vertical piping:

1. Riser clamps shall be steel, B-Line Systems B3373, Elcen 39, Grinnell 261, or Michigan 510.
2. Offset pipe clamps shall be steel, B-Line Systems B3148, Elcen 44, Michigan 700.
3. Clamps for copper tubing shall be copper plated.

E. Insulation protective shields shall be galvanized sheet metal type. Shields shall be 180 degree type at all pipe hangers, except on trapeze hangers, pipe rack and on floor supported horizontal pipes shields shall be 360 degree type.

PART 3 - EXECUTION

3.1 Materials shall be installed in accordance with the manufacturer's published recommendations for installation, in accordance with any listing restrictions of a certifying laboratory or agency, and in accordance with the requirements of the authorities having jurisdiction.

3.2 CUTTING AND PATCHING

A. Do not cut any structural member without written permission from the Architect.

3.7 EQUIPMENT START-UP AND CHECK-OUT

B. Verify readiness for start-up of each item of equipment on the basis of inspection, including:
1. Piping and equipment properly connected.
2. Equipment properly set.

C. Piping Systems:
1. Manually operate relief valves and verify that discharge openings and piping are clear and free-flowing.
2. Open air vents until air is removed from the systems.

D. Start-up equipment and check-out operation in accordance with manufacturer’s published procedures and with the procedures specified herein. Submit report on equipment start-up and check-out with data from recorded findings.

END OF SECTION 22 05 00

SECTION 22 07 00
PLUMBING SYSTEMS INSULATION

PART 1 - GENERAL

1.1 SUBMITTALS

A. Submit product information for piping and valves to the Architect in accordance with Division 1 and Section 22 05 00 Plumbing General.

PART 2 - PRODUCTS

2.1 FIBERGLASS PIPE INSULATION

A. Insulation shall be preformed fiberglass, meeting ASTM C 547, maximum K-value of 0.23 Btu/in. per sq. ft.per °F per hour at 75°F (24°C) mean temperature, and white kraft paper jacket with self-sealing longitudinal lap. Insulation for cold pipes shall also include a vapor barrier.

B. Provide fiberglass pipe insulation for the following cold pipes:
1. Domestic cold water.
2. Indoor condensate drains.
3. Waste pipe receiving condensate.

C. Provide fiberglass pipe insulation for the following hot pipes:
1. Domestic hot water.

D. Fiberglass pipe insulation thickness shall be 1" [except as follows:]

Service	Pipe Size	Thickness
Domestic cold water	All sizes	½"
Domestic hot water, hot water return	up to 2"	½"

E. Insulation shall be: CertainTeed, Johns Manville, Knauf, Schuller, or Owens-Corning.

2.2 MISCELLANEOUS INSULATION MATERIALS

A. Staples shall be outward clinching type.

B. Finishing cement shall be mineral fiber hydraulic-setting thermal insulating cement in accordance with ASTM C 449-1988 manufactured by Keene, Pabco, Ramco, or Rock Wool.

C. Insulation adhesives shall be: Armstrong, Childers, Epolux, Foster, Marathon, or Vimasco.

D. Glass Cloth shall be open-weave type embedded between coats of adhesive or coating materials.

E. Glass Tape shall be 4 inch wide rolls 4.5 ounce/square yard (0.153 kg per square meter).

F. Wire shall be soft annealed galvanized steel, stainless steel or copper wire.

G. Pre-formed insulating fittings shall be equal thickness and composition to adjacent pipe insulation manufactured by: Hamfab, Performance Insulation Fabricators, or Quality-Fit.

H. Fitting Jackets shall be PVC by: Foster Sealfas/Speedline, Schuller, Zeston, or Starr Davis. Fitting jackets shall meet the fire and smoke ratings as stated in Paragraph 1.1.

I. Vapor barriers shall have a maximum permeance of 0.03 perm inches.

PART 3 - EXECUTION

3.1 GENERAL

A. Except as otherwise specified, material shall be installed in accordance with the manufacturer's written instructions.

B. Insulation materials shall not be applied until the following have been completed:
1. Rust, scale, dirt and moisture removed from surfaces to be insulated.
2. Required tests

C. Insulation shall be kept clean and dry. If insulation becomes wet, the insulation shall be removed from the jobsite and replaced with new.

D. Pipe insulation shall be omitted on the following:
1. Air chambers.
2. Underground domestic cold water piping.
3. Vertical portions of interior roof drains.
4. Sanitary drain lines.
5. For the following items where the normal pipe operating temperature is above 60°F. (16°C):
   a. Unions.
   b. Strainers.
   c. Check valves.
6. Chromium plated pipe to plumbing fixtures, except handicapped type fixtures shall have the hot water supply and drain, including the trap, insulated where exposed. The insulation type shall be fiberglass or a pre-manufactured product manufactured specifically for use on handicapped type fixtures.

E. Seal all vapor barrier joints, breaks, and punctures with tape.

3.2 FIBERGLASS PIPE INSULATION

A. Install insulation with jacket drawn tight with side-laps and end joint butt strips secured. End joint butt strips shall be same material as jacket, not less than 3” wide.

B. For cold piping, except domestic cold water, at both butt ends of insulation sections, and at fittings, valves, riser clamps and inserts apply a wet coat of white vapor barrier coating and seal joints with 3" wide vapor barrier tape or band.

C. Insulate fittings, flanges, strainers, unions, and valves with preformed or mitered fiberglass fittings. Fitting insulation shall be same thickness and composition of specified pipe insulation. Wire fittings into place.
1. For hot pipes, cover with a smoothing coat of insulating cement. Finish with glass fabric embedded into a coat of white breather coating.
2. For cold pipes, provide vapor barrier with one layer of glass fabric embedded between two 0.063" (1.6 mm) coats of white vapor barrier coating. Mitered fittings shall receive a smoothing coat of insulating cement prior to finishing.
3. Glass fabric shall overlap adjoining insulation at least 2" (50 mm).

4. Preformed fittings may be provided with PVC fitting jackets in lieu of glass fabric and mastic, subject to manufacturer's published application guidelines. Install jackets in accordance with manufacturer's recommendations and seal the joints on cold piping with 3" wide vapor barrier tape or band.

3.3 PIPES PASSING THOUGH HANGERS

A. Insulation shall be continuous through hangers, except for domestic hot water piping 2-1/2" and smaller.

B. Insulated pipes shall be supported on hangers with the addition of a protection shield to protect insulation. The shield length shall be 6 inches.

C. Vertical pipes shall be supported with riser clamps with the addition of two protection shields covering the 360 degree arc of the insulation. An insulation insert of cellular glass or calcium silicate shall be installed between each shield and the pipe. The insert shall cover the 360 degree arc of the pipe. Inserts shall be the same thickness as the insulation, and shall extend 2 inches (50 mm) on each end beyond the protection shield. If the insulation thickness is less than 1 inch (50 mm) wooden or cork dowels or blocks may be installed between the pipe and the shield to prevent the hanger from crushing the insulation as an option instead of installing insulation inserts.

D. The vertical weight of pipe risers shall be supported with hangers located in a horizontal section of the pipe.

E. Inserts shall be covered with a jacket material of the same appearance and quality as the adjoining pipe insulation jacket, shall overlap the adjoining pipe jacket and shall be sealed as required for the pipe jacket. The jacket material used to cover inserts in flexible cellular insulation shall conform to ASTM C 921, Type 1, and is allowed to be of a different material than the adjoining insulation material.

END OF SECTION 22 07 00

SECTION 22 1423

STORM DRAINAGE

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Provide labor, materials, and equipment necessary for the construction of storm sewers, catch basins, headwalls, spillways, and related items, complete. Conduct in a manner not to conflict with paving, site grading, and other construction.

1.02 SUBMITTALS

A. Manufacturer's Data: Upon request of the Owner, submit four copies of manufacturer's specifications and installation instructions to the Owner for the following products, including laboratory test reports, notarized certifications, or other data required to show compliance with these Specifications:
   1. Pipe, Fittings, and Joints;
   2. Granular material for pipe bedding;
   3. Drainage Casting and Iron Work.

B. Where aluminized or polyethylene storm drain is proposed as an alternate, submit a letter from the Local Jurisdiction approving its use for the application intended.

1.03 REFERENCE STANDARD SPECIFICATIONS

A. Conform to the requirements of "Standard Specifications for Construction of Roads and Bridges", Georgia Department of Transportation for storm sewer work.

B. Where particular sections of the Reference Specifications are cited, comply with applicable Sections of the Reference Specifications.

C. Conform to Local Codes and Specifications. Where conflicts arise between the Local Specifications and these specifications, Local requirements govern.

1.04 PROTECTION OF EXISTING FACILITIES

A. Maintain in operating condition existing surface or subsurface utilities and repair or have repaired to the satisfaction of the Owner any damage to existing utilities.

1.05 CONFINED SPACES

A. Take precautions including but not limited to the provision for ventilators, lights, pulleys, harnesses, communication equipment, and vapor detectors. Use only qualified, trained, and experienced personnel when working in manholes, vaults, pipes and other confined spaces.

PART 2 PRODUCTS

2.01 MATERIALS

A. Reinforced Concrete Pipe: Use pipe conforming to ASTM Specification C-76, Class III, unless otherwise specified or shown on the drawings.

B. Bituminous Coated Corrugated Metal Pipe: Use corrugated metal pipe fully coated a minimum of 0.05" thick. Applicable articles and paragraphs under Storm Sewers, Georgia DOT Specifications, or Local Standards and Specifications, apply. Use corrugated pipe a minimum 16 gauge thickness.

C. Aluminized steel Type 2 corrugated steel pipe: Hot dipped, CSP grade, coating wt. 1.00 oz. per square foot, AASHTO M-274, minimum gauge per Local Jurisdiction requirements.

D. Hugger Bands: Match pipe material and coating with o-ring gaskets.

E. Corrugated polyethylene pipe: Smooth-lined high density polyethylene, AASHTO M252 and AASHTO M294, Type S. Fittings per ASTM F405 and ASTM F667.

F. Catch Basins, Drop Inlets, Headwalls, Junction Boxes, and Spillways:
1. Structures: concrete and/or brick as detailed on contract Drawings.
2. Concrete: conforming to the Site Concrete Section of these Specifications, minimum 28-day compressive strength of 3,000 psi.
3. Brick: hard No.1 manufactured of clay or shale of uniform standard commercial size with straight, parallel edges and square corners, burned uniformly hard entirely through with uniform color and uniform abrasion, ASTM C32.
4. Mortar: ASTM C270, type M.
5. Sand: clean and sharp, and free from deleterious substances and containing not more than five (5) percent by volume of material passing 100 mesh sieve.
6. Coarse aggregate: crushed stone of solid composition, free from dirt and debris, ASTM C33.
7. Gratings: grey iron casting, ASTM A-48.
8. Keep structures clean of all fallen masonry, silt, debris, and other foreign matter.
9. Precast concrete structures: ASTM Specification C478.

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Preparation of Trenches for Pipe Laying.
1. Keep the width of trenches at any point below top of pipe less than the outside diameter of pipe plus 16", to permit satisfactory jointing and thorough tamping of bedding material under and around pipe.
2. Keep trenches free from water until the pipe is laid and trench backfilled and mortar has sufficiently hardened.
3. Shore, barricade and maintain trenches to protect workmen and the public from danger, in accordance with Local, State, and Federal regulations. Lift shoring as backfill is added to trench where shoring is to be removed.
4. Take the depth of the trench at each grade board. Use the average of the two adjacent depths to compute the depth of the cut for that section. If drainage lines are placed by use of laser beam, measure trench depths at points where grade boards would otherwise be. Measure drainage line lengths horizontally from center to center of structures.
5. Open no more than 300 feet of trench at any time.

B. Preparation of Foundation for Pipe Laying
1. Form the foundation in the trench to prevent any subsequent settlement which might result in excessive pressure and consequent rupture of the pipes. Set batter boards at 50 foot intervals to check the line and invert grade.
2. Remove rock in either ledge or boulder formation and replace with selected materials to provide a compacted earth cushion having a thickness between rock and pipe of at least 6". Where bell and spigot pipe is used, maintain cushion under bell as well as under straight portion of pipe.

3. Whenever wet or otherwise unstable soil that is incapable of adequately supporting pipe is encountered in trench bottoms, remove material to depth required and replace to the proper grade with suitable fill material.
4. Construct bedding surfaces for pipe to provide a firm foundation of uniform density throughout entire length of pipe. Carefully bed pipe in a soil foundation that has been accurately shaped and rounded to conform to lowest 1/4 of outside portion of circular pipe. When necessary, tamp bedding firm. Make bell holes and depressions for joints of length, depth, and width as to required properly make joints.
5. Where bedding conditions dictate, lay the pipes in a concrete cradle supported on a masonry foundation carried to a soil of satisfactory bearing, or supported on a structure designed to carry the weight of pipe and its load to a firm bearing.

C. Pipe Laying
1. Carefully examine each length of pipe before laying and reject any defective pipe.
2. Commence the laying of pipes in finished trenches at the lowest point.
3. Lay pipes with ends abutting and true to line and grade. Fit and match pipes so that when laid in the work, they will form a sewer with a smooth and uniform invert.
4. Clean ends of pipe carefully before pipes are lowered into trenches.
5. Set the joints firmly according to line and grade and join together to be structurally sound and water tight.

D. Backfilling Trenches
1. After bedding has been prepared and pipe installed, place suitable fill material along both sides of pipe in layers not exceeding 6" in compacted depth. Bring backfill up evenly on both sides of pipe for its full length. Insure thorough compaction of fill under haunches of pipe. Thoroughly compact each layer with mechanical tampers or rammers. Continue this method of filling and compacting until fill has reached an elevation of at least 6" above the top of pipe. Backfill and compact remainder of trench by spreading and rolling, or compact by mechanical rammers or tampers in layers not exceeding 6".
2. Wet down each layer of fill and backfill to obtain optimum moisture content. Compact to a minimum of 95% of the standard proctor maximum dry density (ASTM D-698).
3. Do not puddle or water flood to consolidate the backfill.
4. Do not walk or work on the completed pipeline, except as necessary in tamping or backfilling, until the trench has been backfilled to a height of at least two feet (2') above the top of the pipes.
5. Fill trench simultaneously on both sides of the pipes is a manner that injurious side pressures do not occur.

E. Drainage Structures
1. Construct drainage structures as shown on drawings.
2. Excavate to required depth and compact the base upon which the structure is to be constructed to a firm even surface.
3. Construct forms for concrete structures of wood or metal. Brace and wire the forms that they will not give or warp under the pressure and loads contemplated in pouring the concrete. Tamp or spade concrete into place to eliminate honeycombing.
4. Brickwork
   a. Lay brick in structures with shove joints completely filled with mortar. In no case are the joints to be made by grouting or by working in mortar after laying the brick. Horizontal joints must not exceed ½", vertical joints 1/4", on their interior face. In circular structures, lay bricks or blocks as headers, breaking joints between courses. Strike interior smooth with face of the wall.

b. "Rack back" or tooth unfinished brick masonry and when new work is jointed to the unfinished portion, cleaned the latter thoroughly.
c. Bond and key brick masonry of sides and arches. Exercise special care with each ring to prevent large joints at the back. Make joints normal to the section and avoid lipping of brick.

F. Flushing Sewers
1. Flush storm sewers with water in sufficient volume to obtain free flow through each line. Remove obstructions and correct defects discovered. Remove dirt and debris from structures.

3.02 RIP RAP

A. Requirements
1. Place a minimum of 10 sq. yds. of 50 lb. minimum stone at spillways and headwalls.
2. Place 50 lb. minimum stone for erosion control.

3.03 PAVEMENT CUTS

A. Repair pavement cut during construction.

B. Use a cutting machine to make pavement cuts. Make straight, parallel lines to conform to the detailed drawings.

C. Provide temporary patches as required in order to properly allow free flow of traffic. Use cold mix asphalt for temporary patches, 3 inches deep furnished flush with adjoining pavement. Use binder course patches with concrete.

D. Provide proper sign, signals and warnings to traffic to prevent risk of injury to motorists.

3.04 TESTS

A. Field Tests: Test the complete sewer between manholes with lanterns and reflected lights, to show a good clear view from manhole to manhole, without obstruction.

3.05 SILT RETENTION BARRIERS

A. Provide material for silt retention barriers as detailed.

3.06 TEMPORARY SURFACE DRAINAGE

A. Leave openings at subgrade in drainage structures for surface drainage.

3.07 DETENTION FACILITIES

A. Install detention facilities including walls, outlet structures, and rip rap as shown on the drawings.

3.08 CLEAN-UP

A. Upon completion of work, remove forms, equipment, protective covering, and rubbish from the premises. Carefully clean interior of sewers of dirt, rubbish and surplus mortar and leave clean and smooth upon completion of contract.

END OF SECTION

SECTION 22 54 10
PLUMBING PIPING, VALVES AND SPECIALTIES

PART 1 - GENERAL

1.1 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing piping systems with the following minimum working pressure ratings, except where indicated otherwise:
1. Water Distribution Systems, Above Ground: 125 psig.
2. Soil, Waste, and Vent Systems: 10-foot head of water.

B. Quality Assurance
1. Comply with the provisions of ASME B31.9 "Building Services Piping" for materials, products, and installation.
2. Provide listing/approval stamp, label, or other marking on piping made to specified standards.

1.2 SUBMITTALS

A. Submit product information for piping and valves to the Architect in accordance with Division 1 and Section 23 5010 MECHANICAL GENERAL.

PART 2 - PRODUCT

2.1 PIPE AND FITTINGS

A. Water Distribution Piping Below Ground:
1. Piping: Soft copper tube, ASTM B 88, Type K.
2. Fittings: Cast copper alloy, solder joint pressure fittings with Alloy Sn95 solder, ASME B16.18.

B. Water Distribution Piping Above Ground:
1. Piping:
a. Hard copper tube, ASTM B 88, Type L.
b. Hot and cold water systems: Chlorinated Polyvinyl Chloride (CPVC) schedule 80, ASTM F-441 and D-2846.
2. Fittings:
a. Wrought-copper or cast copper alloy pressure fittings; and solder joints with Alloy Sn95 solder, ASME B16.22.
b. Schedule 80 socket type CPVC, ASTM F-439 and F-441.
3. Copper Unions: ASME B16.18, cast-copper-alloy body, hexagonal stock, with ball-and-socket joint, metal-to-metal seating surfaces, and solder-joint, threaded, or solder-joint and threaded ends.
4. Threaded Ends: Threads conforming to ASME B1.20.1.
5. Bronze flanges: ASME B16.24, Classes 150 and 300;

C. Soil, Waste, and Vent Piping Below Ground:
1. Piping: Hub-and-spigot cast-iron soil pipe, ASTM A 74.
2. Fittings: Hub-and-spigot cast-iron soil pipe fittings, ASTM C 564 neoprene rubber gaskets, lubricant, and compression joints, ASTM A 74, Service Class.

D. Soil, Waste, and Vent Piping Above Ground:
1. Piping: Hubless cast-iron soil pipe, CISPI 301.

2. Fittings: Hubless cast-iron soil pipe fittings; stainless-steel, or cast-iron couplings for hubless cast-iron soil pipe and fittings; and hubless joints, with ASTM C 564 neoprene sealing sleeve, with stainless-steel corrugated shield-and-clamp assembly, CISPI 301.
3. Sealing gasket: ASTM C 564 neoprene sealing gasket, with cast-iron housing and stainless steel bolts.

E. Wrought-Copper and Bronze, Grooved-End Fittings: ASTM B 75 (ASTM B 75M) Tube and ASTM B 584 Bronze Castings.

F. Wrought-Copper, Solder-Joint, DWV Drainage Fittings: ASME B16.29.

G. Cast-Copper-Alloy, Solder-Joint, DWV Drainage Fittings: ASME B16.23.

H. Malleable-Iron Unions: ASME B16.39, Classes 150 and 300, hexagonal stock, with ball-and-socket joint, metal-to-metal bronze seating surfaces, and female threaded ends having threads conforming to ASME B1.20.1.

I. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern, with threads conforming to ASME B1.20.1.

J. Galvanized, Cast-Iron Threaded Fittings: ASME B16.4, Classes 125 and 250, standard pattern, with threads conforming to ASME B1.20.1.

K. Galvanized, Cast-Iron Threaded Drainage Fittings: ASME B16.12, recessed drainage pattern, with threads conforming to ASME B1.20.1.

2.2 VALVES

A. Unless indicated otherwise, provide valves as follows:
1. Shutoff Duty: Ball valves.
2. Throttling Duty: Ball valves.

B. Provide rising stem or rising outside screw and yoke stems. Nonrising stem valves may be used where headroom prevents full extension of rising stems.

C. Unless otherwise indicated, valves size shall be same size as upstream pipe.

D. Operators: Provide the following special operator features:
1. Handwheels, fastened to valve stem, for valves other than quarter turn.
2. Lever handles, on quarter-turn valves.

E. Extended Stems: Where insulation is indicated or specified, provide extended stems arranged to receive insulation.

F. Comply with MSS SP-45 for bypass and drain connections.

G. Provide valves with the following connections types:
1. Solder-Joint for copper tube, 2" and smaller. Comply with ANSI B16.18. Use solder having a melting point below 840 F (449 C) for gate, globe, and check valves; below 421 F (216 C) for ball valves.
2. Threaded for steel pipe, 2" and smaller. Comply with ANSI B1.20.1.
3. Flanged for steel pipe, 2-1/2" and larger. Comply with ANSI B16.1 for cast iron, ANSI B16.5 for steel, and ANSI B16.24 for bronze valves.

H. Ball Valves

1. Ball Valves, 1 Inch and Smaller: two-piece construction; with bronze body conforming to ASTM B 62, standard (or regular) port, chrome-plated brass ball, replaceable "Teflon" or "TFE" seats and seals, blowout-proof stem, and vinyl-covered steel handle. Provide solder ends for domestic hot and cold water service.
2. Ball Valves, 1-1/4" to 2": 3-piece construction; with bronze body conforming to ASTM B 62, conventional port, chrome-plated brass ball, replaceable "Teflon" or "TFE" seats and seals, blowout proof stem, and vinyl-covered steel handle. Provide solder ends for domestic hot and cold water service.
3. Ball valves shall be: Conbraco, Crane, Grinnell, Jamesbury, Jenkins, Lunkenheimer, Nibco, Powell, Stockham, or Watts

2.3 PIPING SPECIALTIES

A. Water Hammer Arresters: ASME A112.26.1M, ASSE 1010, or PDI WH-201, bellows or piston type with pressurized cushioning chamber. Sizes are based on water-supply fixture units, ASME A112.26.1M sizes "A" through "F" and PDI WH-201 sizes "A" through "F." Water Hammer Arresters shall be: Amtrol, Ancon, Jones, Josam, Precision, Smith, Sioux, Wade, Watts or Zurn.

B. Cleanouts: Size cleanouts as indicated on drawings, or where not indicated, same size as connected drainage piping. Cleanouts larger than 4 inches are not required except where indicated. Provide ASME A112.36.2M, cast-iron body with straight threads and gasket seal or taper threads for plug, flashing flange and clamping ring, and a brass closure plug. Cleanouts for installation in floors not having membrane waterproofing may be furnished without clamping ring.

PART 3 - EXECUTION

3.1 WATER DISTRIBUTION PIPING

A. Install piping level without pitch.

3.2 DRAINAGE AND VENT PIPING INSTALLATION

A. Install cast-iron soil pipe and cast-iron soil pipe fittings according to CISPI 1990 revised and edited edition of "Cast Iron Soil Pipe and Fittings Handbook, Volume I," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

B. Make changes in direction for drainage and vent piping using appropriate Y branches, Y branches with 1/8 bends, and long-sweep 1/4, 1/5, 1/6, 1/8, and 1/16 bends. Sanitary tees and short-sweep quarter bends may be used on vertical stacks of drainage lines where change in direction of flow is from horizontal to vertical. Use long-turn double-Y-branch and 1/8-bend fittings where 2 fixtures are installed back to back or side by side and have a common drain. Straight tees, elbows, and crosses may be used on vent lines. Make no change in direction of flow greater than 90 degrees. Where different sizes of drainage pipes and fittings are connected, use proper size standard increasers and reducers. Reduction of the size of drainage piping in the direction of flow is prohibited.

C. Install drainage and vent piping at the following minimum slopes, except where another slope is indicated:
1. Horizontal Sanitary Drainage Piping: 1/4 inch per foot.
2. Vent Piping: 1/8 inch per foot.

3.3 CONNECTIONS

A. Supply Runouts to Fixtures: Install hot- and cold-water supply piping runouts of sizes indicated, but not smaller than required by plumbing code to fixtures.

B. Drainage Runouts to Fixtures: Provide drainage and vent piping runouts, with approved trap, of sizes indicated, but not smaller than required by plumbing code, to plumbing fixtures and drains.

C. Locate drainage piping runouts as close as possible to bottom of floor slab supporting fixtures or drains.

3.4 VALVES

A. Locate valves for easy access and provide separate support where necessary.

B. Install valves and unions for each fixture and item of equipment arranged to allow equipment removal without system shutdown. Unions are not required on flanged devices.

C. Install valves in horizontal piping with stem at or above the center of the pipe.

D. Install valves in a position to allow full stem movement.

E. Shutoff Valves: Install shutoff valves on inlet to each plumbing equipment item, on each supply to each plumbing fixture not having stops on supplies, and elsewhere as indicated. For shutoff valves 2" and smaller, use ball valves.

3.5 PIPING SPECIALTY INSTALLATION

A. Install cleanouts in above-ground piping and building drain piping as indicated, and where not indicated, according to the following:
   1. Size same as drainage piping up to 4 inches size. Use 4 inches size for larger drainage piping except where larger size cleanout is indicated.
   2. Locate at each change in direction of piping greater than 45 degrees.
   3. Locate at minimum intervals of 50 feet for piping 4 inches and smaller and 100 feet for larger piping.
   4. Locate at base of each vertical soil or waste stack.

B. Install cleanout deck plates (covers), of types indicated, with top flush with finished floor, for floor cleanouts for piping below floors.

C. Install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall, for cleanouts located in concealed piping.

D. Install flashing flange and clamping device with each stack and cleanout passing through floors having waterproof membrane.

3.6 FIELD QUALITY CONTROL

A. Inspect water distribution piping as follows:
   1. Do not enclose, cover, or put into operation water distribution piping system until it has been inspected and approved by the authority having jurisdiction.
   2. During progress of the installation, notify the plumbing official having jurisdiction at least 24 hours prior to time inspection must be made. Perform tests specified below in presence of the plumbing official.
      a. Roughing-In Inspection: Arrange for inspection of piping system before concealed or closed-in after system roughing-in and prior to setting fixtures.

b. Final Inspection: Arrange for final inspection by plumbing official to observe tests specified below and to ensure compliance with requirements of plumbing code.

3. Reinspections: When a plumbing official finds that piping system will not pass test or inspection, make required corrections and arrange for reinspection by the plumbing official.
4. Reports: Prepare inspection reports signed by plumbing official.

B. Test water distribution piping as follows:
1. Test for leaks and defects in new water distribution piping systems and parts of existing systems that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of system tested.
2. Leave uncovered and unconcealed in new, altered, extended, or replaced water distribution piping until it has been tested and approved. Expose work that has been covered or concealed before it has been tested and approved for testing.
3. Cap and subject the piping system to a static water pressure of 50 psig (345 kPa) above the operating pressure without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for 4 hours. Leaks and loss in test pressure constitute defects that must be repaired.
4. Repair leaks and defects with new materials and retest system or portion thereof until satisfactory results are obtained.
5. Prepare reports for tests and required corrective action.
6. Inspect drainage piping as follows:
   a. Do not enclose, cover, or put into operation drainage and vent piping system until it has been inspected and approved by the authority having jurisdiction.
   b. During progress of installation, notify the plumbing official having jurisdiction at least 24 hours prior to time such inspection must be made. Perform tests specified below in presence of the plumbing official.
   c. Roughing-In Inspection: Arrange for inspection of piping system after system roughing-in, before concealing, and prior to setting fixtures.
   d. Final Inspection: Arrange for final inspection by plumbing official to observe tests specified below and to ensure compliance with requirements of plumbing code.
7. Reinspections: Make required corrections and arrange for reinspection by plumbing official when piping system fails to pass test or inspection.
8. Reports: Prepare inspection reports signed by the plumbing official.

C. Drainage and Vent Piping System Tests: Test drainage and vent systems according to procedures of authority having jurisdiction or, in absence of published procedure, as follows:
1. Test for leaks and defects in new drainage and vent piping systems and parts of existing systems that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with a diagram of the portion of the system tested.
2. Leave uncovered and unconcealed in new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose for testing work that has been covered or concealed before it has been tested and approved.
3. Rough Plumbing Test Procedure: Except for outside leaders and perforated or open-jointed drain tile, test piping of plumbing drainage and venting systems on completion of roughing-in piping installation. Tightly close all openings in piping system and fill with water to point of overflow, but not less than 10 feet head of water (30 kPa). Water level shall not drop during the period from 15 minutes before inspection starts through completion of inspection. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and their traps filled with water, test connections and prove gastight and watertight. Plug stack openings on roof and building drain where it leaves the building and introduce air into the system

equal to pressure of 1 inch water column (250 Pa). Use a U tube or manometer inserted in the trap of a water closet to measure this pressure. Air pressure shall remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.

5. Repair leaks and defects using new materials and retest system or portion thereof until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.7 CLEANING

A. Clean and disinfect water distribution piping as follows:
   1. Purge new potable water distribution piping systems and parts of existing potable water systems that have been altered, extended, or repaired prior to use.
   2. Use purging and disinfecting procedure prescribed by authority having jurisdiction or, if a method is not prescribed by that authority, the procedure described in either AWWA C651 or AWWA C652 or as described below:
      a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
      b. Fill system or part thereof with water/chlorine solution containing at least 50 parts per million of chlorine. Isolate (valve off) and allow to stand for 24 hours.
      c. Drain system or part thereof of previous solution and refill with water/chlorine solution containing at least 200 parts per million of chlorine. Isolate and allow to stand for 3 hours.
      d. Flush system with clean, potable water until chlorine does not remain in water coming from system following allowed standing time.
      e. Submit water samples in sterile bottles to authority having jurisdiction. Repeat procedure if biological examination made by the authority shows evidence of contamination.

B. Prepare and submit reports for purging and disinfecting activities.

C. Clean interior of piping system. Remove dirt and debris as work progresses.

3.8 COMMISSIONING

A. Fill water systems.

B. Before operating systems, perform these steps:
   1. Close drain valves, hydrants, and hose bibbs.
   2. Open shutoff valves to full open position.
   3. Open throttling valves to proper setting.
   4. Remove plugs used during testing of piping systems and plugs used for temporary sealing of piping during installation.
   5. Remove and clean strainer screens. Close drain valves and replace drain plugs.

C. Check plumbing equipment and verify proper settings, adjustments, and operation. Do not operate water heaters before filling with water.

D. Check plumbing specialties and verify proper settings, adjustments, and operation.

END OF SECTION 22 54 10

SECTION 22 54 40

PLUMBING FIXTURES

PART 1 - GENERAL

1.1 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with requirements of ANSI Standard A117.1, "Buildings and Facilities -- Providing Accessibility and Useability for Physically Handicapped People," and Public Law 90-480, "Architectural Barriers Act, 1968," with respect to plumbing fixtures for the physically handicapped.

B. Listing and Labeling: Provide electrically operated fixtures specified in this Section that are listed and labeled.
1. The terms "listed" and "labeled" shall be 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.

1.2 DELIVERY, STORAGE, AND HANDLING

A. Deliver plumbing fixtures in manufacturer's protective packing, crating, and covering.

B. Store plumbing fixtures on elevated platforms in a dry location.

1.3 SUBMITTALS

A. Submit product information for plumbing fixtures to the Architect in accordance with Division 1 and Section PLUMBING GENERAL.

PART 2 - PRODUCTS

2.1 GENERAL

A. Furnish, set and connect all plumbing fixtures and trim, fittings, other components, and supports as specified hereinafter.

B. Manufacturers: All fixtures shall be the product of the same manufacturer, except for special types indicated.

C. Provide chrome plated finish on all exposed supply and waste services.

2.2 FIXTURES

A. Water Closets:
1. Manufacturers: Provide a product of one of the following:
a. American Standard, Inc.
b. Crane Plumbing/Fiat Products.
c. Eljer; A Household International Co.
d. Kohler Co.
e. Mansfield Plumbing Products, Inc.
f. Universal-Rundle Corp.

2. Water Closets: See Plumbing Fixture Connection Schedule on Drawings.

2.3 FIXTURE TRIM

A. Toilet Seats:
1. Manufacturers: Provide a product of one of the following:
a. Bemis Mfg. Co.
b. Beneke Div.; Sanderson Plumbing Products, Inc.
c. Church Seat Co.
d. Kohler Co.
e. Olsonite Corp.
f. Sperzel Industries, Inc.
2. General: Provide toilet seats compatible with water closets, and of type, color, and features indicated.
3. Toilet Seats: Extra heavy-duty, commercial/industrial type, elongated, open front, solid plastic, with check hinge.

B. Fittings
1. Manufacturers: Provide a product of one of the following:
a. Brass Craft
b. McGuire Mfg. Co.
c. Kohler Co.
2. General: Unless otherwise specified, provide fittings fabricated of brass, with a polished chrome plated finish.
3. Supplies and Stops: Wheel handle angle stop, having 1/2 inch NPS inlet with wall flange and 3/8 inch by 12 inches flexible tubing riser outlet.
4. Escutcheons: Polished chrome-plated, sheet steel wall flange with friction clips.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for potable cold water and hot water supplies and soil, waste, and vent piping systems to verify actual locations of piping connections prior to installing fixtures.

B. Examine walls, floors, and cabinets for suitable conditions where fixtures are to be installed.

C. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF PLUMBING FIXTURES

A. Install plumbing fixtures level and plumb, in accordance with fixture manufacturers' written installation instructions, roughing-in drawings, and referenced standards.

B. Install floor-mounted, floor-outlet water closets with closet flanges and gasket seals.

C. Install wall-hanging, back-outlet water closets with support manufacturer's tiling frame or setting gage.

D. Fasten wall-hanging plumbing fixtures securely to supports attached to building substrate when supports are specified, and to building wall construction where no support is indicated.

E. Fasten counter-mounting-type plumbing fixtures to casework.

F. Secure supplies behind wall or within wall pipe space, providing rigid installation.

G. Install stop valve in an accessible location in each water supply to each fixture.

H. Install trap on fixture outlet except for fixtures having integral trap.

I. Install escutcheons at each wall, floor, and ceiling penetration in exposed finished locations and within cabinets and millwork. Use deep pattern escutcheons where required to conceal protruding pipe fittings.

J. Seal fixtures to walls, floors, and counters using a sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color.

3.3 ADJUSTING, CLEANING AND PROTECTION

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Adjust water pressure at faucets and flushometers having controls, to provide proper flow and stream.

C. Replace washers of leaking and dripping faucets and stops.

D. Clean fixtures, fittings, and spout and drain strainers with manufacturers' recommended cleaning methods and materials.

E. Provide protective covering for installed fixtures and fittings.

END OF SECTION 22 54 40

SECTION 23 50 10

MECHANICAL GENERAL

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. The requirements specified herein shall apply to all Sections of Division 23.

B. Warranties:
1. The contractor shall warrant to the Owner that all work shall be free from defects and will conform to the contract documents. This warranty shall extend not less than one year from the date of beneficial occupancy.

2. In addition to warranties indicated in the General Conditions each air conditioning compressor shall have an additional four year warranty on the compressor for parts only, for a total 5 year warranty.

C. The plans accompanying these specifications are generally diagrammatic and do not show all details required for the complete work. Establish details of the work as necessary to provide for the complete installation of systems and materials.

D. Coordinate the work to avoid conflicts with items such as plumbing and fire protection piping, beams, fire barriers, ceiling types and heights, slab or wall thickness, cabinet heights, or door swings. Do not scale the plans for dimensions. Verify dimensions before starting work and report any discrepancy or interference to the Owner's representative for clarification.

1.2 QUALITY ASSURANCE

A. All mechanical work shall be in accordance with the following codes and agencies:
1. International Building Code, 2006 Edition, with latest Georgia Amendments
2. International Fuel Gas Code, 2006 Edition, with latest Georgia Amendments
3. International Mechanical Code, 2006 Edition, with latest Georgia Amendments
4. International Plumbing Code, 2006 Edition, with latest Georgia Amendments
5. The International Energy Conservation Code, 2006 Edition with latest Georgia Amendments.
6. State and local ordinances governing mechanical work.
7. SMACNA HVAC Duct Construction Standards.

B. Where the requirements of the specifications or drawings exceed those of referenced codes, standards and regulations, the drawings or specifications shall govern.

C. Where UL listing is required, equipment and materials shall bear the UL label.

D. The manufacturer's names and catalog numbers are subject to compliance with requirements. Substitutes of equivalent materials and equipment may be submitted for consideration. Any proposed exceptions to requirements shall be clearly and fully stated in one place, including required related changes to building systems, operating procedures, and maintenance functions.

1.3 PERMITS AND FEES

A. Deliver to the Owner all certificates of inspection where applicable.

B. Pay charges related to all utility connections and coordinate with utility company.

1.4 SUBMITTALS

A. See Division 01 for additional submittal requirements.

B. Provide submittals to indicate compliance with requirements. Submittals shall include:
1. Specification paragraph.
2. Manufacturer and model number.
3. Schedule information.
4. Electrical characteristics.
5. Accessories and options.
6. Installation instructions.
7. Deviations from requirements.

C. Product information for the following items shall be submitted for review:
1. Equipment scheduled on the drawings.
2. Vibration isolation.
3. Other items specifically indicated to be submitted for review in other Sections.

D. Dimensioned drawings for the following shall be submitted. Reproducible copies of contract drawings shall not be used for creation of shop drawings. Indicate coordination with plumbing, fire protection, electrical, structural, and architectural design.
1. 1/4” = 1’-0” scale floor plan drawings showing HVAC ductwork including mounting heights above finished floor.

E. Record on one set of plans all changes and deviations from the contract plans. Record final location of equipment, piping, controls, ductwork, etc. Make sufficient measurements to locate major duct and piping runs and show same on record plans as as-built conditions. Transfer changes and deviations to project drawings and deliver same to Owner's representative.

F. Submittals not specifically required, or not complying with the format requirements, will be returned unreviewed.

1.5 OPERATION AND MAINTENANCE INSTRUCTIONS

A. See Division 1 for additional requirements for Operation and Maintenance (O&M) instructions.

B. Provide a minimum of 2 sets of O&M Manuals. One copy of O&M information shall be submitted for review prior to delivery to the Owner. The manuals shall consist of printed material that shall, as a minimum, include:
1. Parts lists for individual components of each piece of equipment.
2. Manufacturer's name and address.
3. Location of local parts supplier.
4. Manufacturer's published operation and maintenance instructions.
5. Data sheets highlighting equipment designations and model numbers.
6. Data sheets for fans shall include fan curve or performance data for the full range of static pressure and cfm capabilities, not just the design point.
7. HVAC Controls.
8. Final test and balance report.

C. Each Manual shall be compiled as follows:
1. Data shall be bound in smooth surface hard back commercial quality three-ring notebooks with project identification shown on the front cover and binding back. Identification labels shall be typed and adhered with waterproof glue.
2. Notebooks shall have 9-1/2-inch by 11-1/2-inch covers with back width to permit the covers to lie parallel or to converge, and have not less than 1-1/2-inch back width.

3. Tabbed index divider sheets of heavy Manila paper shall be inserted between each section of the Manual for identification of Sections.
4. Data sheets and diagrams shall be 8-1/2-inch x 11-inch or be mounted on 8-1/2-inch x 11-inch sheets. Drawings and diagrams larger than 8-1/2-inch by 11-inch shall be folded up from the bottom to form a height of 11-inches and folded to the left to form a width of 8-1/2-inches

1.6 INSTRUCTION OF OWNER PERSONNEL

A. Prior to a request for final inspection, at a time designated by the Architect, instruct operating personnel designated by the Owner in operation and maintenance of the systems. The contractor shall give notice to the Architect not less than 30 days prior to the anticipated date of instruction to allow planning by the Owner.

B. The training sessions shall include time in the field. The O&M Manuals shall be used as the basis of instruction. Prepare and insert additional data when need for such data becomes apparent during instruction.

1.7 COMPLETION OF WORK

A. At a minimum of two weeks prior to a request for final inspection, the contractor shall have completed and submitted the complete test and balance report.

B. Incomplete Work: Prior to starting the inspection process at the semifinal or other inspections where work is inspected as being completed, the contractor shall give the Architect a list of work not completed, reason for incompletion, and date when said work will be completed.

C. Inspection: At final inspection the entire system shall be shown to be in specified working condition. The following shall be available during the inspection:
1. Contractor Representative.
2. Mechanic with hand tools.
3. Specified test data.
4. Certificates.
5. Controls Manufacturer's Representative.
6. Complete Specifications and Drawings with all addenda and revisions.
7. Operating and Maintenance Manuals.
8. Final submitted and approved test and balance report.
9. Contractor's Pre-Final Punch list indicating disposition of all items with initials of person confirming completion.

D. Uncovering of Concealed Work: Floor cleanouts shall be opened for inspection and then re-closed. Other concealed areas shall be opened upon request, where access is provided.

1.8 ELECTRICAL COORDINATION

A. Review Division - Electrical for services supplied to equipment requiring electrical service. Provide equipment that matches services provided.

B. Drawings are based on the equipment of one manufacturer. If equipment actually furnished have requirements other than those indicated on the drawings, services shall be adjusted as required, at no additional cost to the owner. Such adjustments are subject to review by the Architect.

C. Motor quantities and sizes indicated are the minimum requirements. Larger motor sizes and equipment wattage ratings may be provided if necessary to meet the performance requirements specified herein or indicated on the Drawings. Where the provided motor quantity or sizes differ

from indicated motor quantity or size, coordinate the electrical revisions and provide at no additional cost to the Owner.

D. Do not install ductwork, mechanical piping, or mechanical equipment in the following rooms or areas unless indicated on the Drawings:
1. Electrical equipment rooms.
2. Directly above or below electrical equipment.
3. Maintain working clearances .as defined in Article 110 of the National Electrical Code.
4. Electrical equipment shall include panelboards, switchgear, transformers, and starters.

1.9 PRODUCT DELIVERY, STORAGE, HANDLING, AND PROTECTION

A. Provide a dry, weathertight space for storing materials. Store packaged materials in original shipping containers with manufacturer's labels and seals intact. Store equipment and material off the ground or floors exposed to rain.

B. Protect units against damage to coils by installing temporary closure panels over inlet openings. Panels shall be sheet metal, at least 24 gauge. Install closure panels over unit outlets until ductwork is connected.

C. Plug ends of pipes when work is stopped to prevent debris from entering pipes.

D. Close open ends of ductwork with temporary closures of sheet plastic taped in place on horizontal ducts and sheet metal caps with drip overhangs from ducts opening upward.

E. Equipment and materials shall not be installed until environmental conditions of the job site are suitable. Replace damaged materials.

1.10 CLEANING AND PAINTING

A. Remove oil, dirt, grease and foreign materials from all equipment to provide a clean surface. Touch-up scratched or marred surfaces of equipment enclosures with paint manufactured specifically for that purpose.

1.11 SEQUENCING AND SCHEDULING

A. Arrange for chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.

B. Coordinate the installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Obtain approval from the Owner and Architect at least 7 days prior to any utility interruption or connection.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Equipment and materials shall be new.

B. Once a product line has been established, it shall be consistently maintained throughout the entire installation.

C. Low voltage control wiring shall be not less than #18 plastic covered, color coded. Line voltage wiring shall not be smaller than #16, 600 volt wire. All wiring in mechanical rooms, in other exposed areas, and above inaccessible ceilings shall be run in conduit with outlet boxes and fittings as specified in Division 16. Low voltage wiring located above accessible ceilings shall be plenum rated. All wiring shall be installed in accordance with NFPA-70 Article 725. Sensor wiring shall be not less than #20 twisted, shielded. Wiring associated with duct mounted smoke detectors shall be rated for fire alarm usage and shall be compatible with the Fire Alarm System's wiring methods.

2.2 MOTORS

A. Unless indicated otherwise motors shall be:
1. Dripproof type
2. In compliance with NEMA MG1.
3. 1800 rpm, induction type with a 1.15 service factor.

B. All motors 1.0 horsepower and above shall be energy efficient in accordance with NEMA MG1.

C. The following equipment shall be provided with totally enclosed or weather-protected type 1 motors:
1. Outdoor air-cooled equipment.

D. Motors not provided with equipment shall be: Baldor, Century, Delco, GE, Marathon, Reliance, or Siemens.

E. Variable Frequency Drives:
1. Variable frequency drives (VFD) shall be UL labeled, pulse width modulation type, wall or floor mounted in NEMA 1 enclosure with disconnect and door interlock.
2. Controllers shall be designed to avoid RF interference with other electronic equipment in the building in accordance with FCC regulation, Part 15, subpart J.
3. If the Owner experiences problems due to harmonics generated from the VFD during the first year of actual operation, then modifications shall be made to the VFD to eliminate the interference.
4. The VFD shall be able to communicate with the DDC control system. Communication capabilities shall include, but not be limited to, run-stop control, speed set adjustment, and PID control adjustments.
5. Interface connections for remote controls shall be wired to terminal strips as follows:
   a. Dry contacts for remote enable/disable.
   b. Process transducers for 4-20 ma speed adjustment signal.
   c. Terminals for connection of normally closed remote safety devices.
   d. External alarm contacts, dry type, to open on internal drive fault, power supply fault, process transducer signal fault, or operation of remote safety devices.
6. Provide additional following features:
   a. Current limiting fuses, or electronic semi-conductor protection on incoming line side.
   b. Power on light.
   c. Status indicator lights.
   d. Separately adjustable minimum and maximum speeds.
   e. Full time current limit.
   f. Front panel mounted speed indicator, 0 to 100%.
   g. Hand-off-automatic switch.
   h. Manual speed control for local operation by means of a potentiometer or increase/decrease speed buttons.
7. Provide the following protective features:
   a. Inverse time overcurrent protection.
   b. Overcurrent.

c. Overvoltage and undervoltage.
d. Ground fault.
e. Overheat.
f. Load short-circuit.
g. Acceleration and deceleration.
h. Stall prevention/current.
i. Input and output phase loss and control circuit faults.

8. Factory tests shall include a 4 hour burn-in test. the drive shall be burned in at 100% inductive or motor load for 4 hours without shutdown.
9. Variable frequency drives shall be: ABB, Allen-Bradley, Cutler-Hammer, Graham, MagneTek, Omron, Reliance, Robicon, Square D, Toshiba, or York.

PART 3 - EXECUTION

3.1 Materials shall be installed in accordance with the manufacturer's published recommendations for installation, in accordance with any listing restrictions of a certifying laboratory or agency, and in accordance with the requirements of the authorities having jurisdiction.

3.2 CUTTING AND PATCHING

A. Do not cut any structural member without written permission from the Architect.

3.7 EQUIPMENT START-UP AND CHECK-OUT

B. Verify readiness for start-up of each item of equipment on the basis of inspection, including:
1. Adjustment of vibration isolators.
2. Alignment of shafts and couplings.
3. Direction of rotation by jogging motor.
4. Completion of lubrication procedures.
5. Piping and equipment properly connected.
6. Equipment properly set.
7. Wiring properly connected.
8. Controls, safeties, and time switches properly set.
9. Electrical overloaded relays appropriate for load.
10. Electrical accessories properly installed and adjusted.
11. Clean filters in place.

C. Prepare first-run checklist for equipment, perform first-run observations and record findings.
1. Verify direction of motor rotation after final electrical connections.
2. Measure ampere draw of electric motors and compare with nameplate rating and with overload heater ratings.
3. Monitor temperature build-up in motors and bearings.

D. Start-up equipment and check-out operation in accordance with manufacturer’s published procedures and with the procedures specified herein. Submit report on equipment start-up and check-out with data from recorded findings.

E. In addition to other requirements specified herein, manufacturer shall provide services to start-up, check-out, and test the following equipment and systems:
1. Packaged Air Conditioning Units.

F. Fire and smoke dampers and combination fire/smoke dampers:
1. Prove each damper operates correctly and has adequate access after damper installation by removing link and operating damper.

3.8 TESTING, ADJUSTING AND BALANCING

A. The Contractor shall obtain the services of an independent test and balancing agency who shall perform testing and balancing of:
   1. Air distribution systems including each register and diffuser.
   2. Scheduled equipment.

B. The testing and balancing agency shall be a certified member of AABC that specializes in, and whose business is limited to the testing and balancing of HVAC systems. The balancing personnel shall be familiar with and perform the balancing in accordance with AABC procedures using forms of the appropriate organization.

C. Instruments used for testing and balancing of air and hydronic systems shall have been calibrated within (6) months prior to balancing.

D. Final readings shall be set within -5% and +10% of design conditions.

E. Report format:
   1. Report forms shall be the standard forms of the AABC or NEBB.
   2. The report shall by typed and bound in a hardback 3-ring binder.
   3. Include a title page with name and address of project; name and address of Contractor; dates of all tests; name and telephone number of balancing agency.
   4. Flow data for each register, grille and diffuser.
   5. Flow data for each piece of equipment.
   6. Report any defects, deficiencies, or abnormal conditions in the mechanical systems which prevent system balance. Make recommendations for correcting unsatisfactory items which cannot be successfully balanced.
   7. Report shall be signed by balancer and shall have been completed and submitted prior to final inspection.

F. Do not proceed with adjusting and balancing work until work is complete and operable, and piping and ductwork testing, cleaning and flushing, specified equipment start-up and check-out is complete.

G. Air system procedure:
   1. Adjust air handling and distribution systems to provide required or design supply, return, relief, and exhaust air quantities.
   2. Make air quantity measurements in ducts by traverse of entire cross sectional area of duct.
   3. Measure air quantities at air inlets and outlets.
   4. Use volume control devices to regulate air quantities only to the extent that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers.
   5. Vary total system air quantities by adjustment of fan speeds. Replace equipment belts and/or sheaves as necessary for the correct performance of the system test and balance. Vary branch air quantities by damper regulation.
   6. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Allow for 50 percent loading of filters.
   7. Adjust automatic outside air, return, relief and exhaust air dampers for design conditions. For variable volume systems, balance for minimum outside air, when each air handling unit is operating at its maximum air quantity. Return air dampers shall be adjusted to a less than fully open position only if required to achieve the minimum outside air quantity indicated on the drawings. Return and minimum outside air damper linkages shall be adjusted to position their respective dampers at full stroke.

8. Measure temperature conditions across closed outside air, return air, relief air and exhaust air dampers to check leakage.
9. Where modulating dampers are provided, take measurements and balance at extreme conditions.
10. Adjust pattern adjustment devices in diffusers for horizontal discharge, unless otherwise indicated on the drawings.
11. Balance and adjust systems to prevent food odor from migrating from kitchen and dining areas.

H. The Test and Balance Agency shall:
1. Retest, adjust, and balance systems subsequent to significant system modifications; re-record test results.
2. Report excessive noise levels and vibration that cannot be corrected by balancing procedures.
3. Record all data representing actually measured or observed condition.
4. Patch holes in insulation, vapor barriers, ductwork, and housings, which have been cut or drilled for test purposes.
5. Mark equipment settings, including damper control positions, valve indicators, fan speed control devices, and controls and devices, to show final settings at completion of testing, adjusting, and balancing work. Provide markings either paint or permanent identification materials.

END OF SECTION 23 5010

SECTION 23 52 50

MECHANICAL INSULATION

PART 1 - GENERAL

1.1 QUALITY ASSURANCE

A. Materials shall be the standard products of manufacturers regularly engaged in the production of insulation products. Insulation materials shall be products that have been in use in commercial buildings for at least 2 years prior to bid opening.

B. Insulation shall be installed by workers regularly employed for this type of work.

C. Unless otherwise specified, indoor insulation, adhesives and tapes shall have a flame spread rating no higher than 75 and a smoke developed rating no higher than 150.

D. The outside surface of insulation systems which are located in air plenums, in ceiling spaces, and in attic spaces shall have a flame spread rating no higher than 25 and a smoke developed rating no higher than 50.

E. Flame spread and smoke developed ratings shall be determined by ASTM E 84-1991a. Jackets shall comply with the flame spread and smoke developed ratings required by ASTM C 921. Products shall bear a label indicating flame spread and smoke developed ratings.

F. Materials containing asbestos shall not be used.

1.2 SUBMITTALS

A. Submit product information for insulation materials to the Architect in accordance with Division 1 and Section 23 5010 MECHANICAL GENERAL.

PART 2 - PRODUCTS

2.1 FIBERGLASS BLANKET INSULATION

A. Fiberglass blanket insulation shall be 0.75 pcf density and meeting ASTM C 553, Type 1, with maximum K-value of 0.28 at 75°F (24°C) mean temperature. Vapor barrier jacket shall be aluminum foil reinforced with fiber glass yarn and laminated to fire-resistant kraft.

B. Insulate the following with 2” thick fiberglass blanket insulation:
1. Galvanized steel supply ductwork not insulated with internal lining.
a. Except: Supply ductwork exposed in air conditioned spaces shall not be insulated unless otherwise shown on the drawings.

C. Insulation shall be: CertainTeed, Johns Manville, Knauf, Schuller, or Owens-Corning.

2.2 FIBERGLASS DUCT LINER

A. Fiberglass duct liner shall be 1.5 pcf density meeting ASTM C 1071 and maximum K-value of 0.25 at 75°F (24°C) mean temperature. Liner shall be 1” thick, except where indicated on the drawings as 2” thick. Provide surface coating with anti-microbial agent on the airstream side to prevent erosion of glass fibers during normal operation.

B. Insulate the following with fiberglass duct liner:
1. Locations indicated on the drawings.

C. Insulation shall be: CertainTeed, Johns Manville, Knauf, Schuller, or Owens-Corning.

2.3 MISCELLANEOUS INSULATION MATERIALS

A. Staples shall be outward clinching type.

B. Finishing cement shall be mineral fiber hydraulic-setting thermal insulating cement in accordance with ASTM C 449-1988 manufactured by Keene, Pabco, Ramco, or Rock Wool.

C. Insulation adhesives shall be: Armstrong, Childers, Epolux, Foster, Marathon, or Vimasco.

D. Insulation protection for piping and ductwork exposed to weather outside the building shall be corrugated aluminum or embossed finish 0.016" thick for ductwork and straight piping. Screws for aluminum covers shall be stainless steel.

E. Glass Cloth shall be open-weave type embedded between coats of adhesive or coating materials.

F. Glass Tape shall be 4 inch wide rolls 4.5 ounce/square yard (0.153 kg per square meter).

G. Wire shall be soft annealed galvanized steel, stainless steel or copper wire.

H. Pre-formed insulating fittings shall be equal thickness and composition to adjacent pipe insulation manufactured by: Hamfab, Performance Insulation Fabricators, or Quality-Fit.

I. Fitting Jackets shall be PVC by: Foster Sealfas/Speedline, Schuller, Zeston, or Starr Davis. Fitting jackets shall meet the fire and smoke ratings as stated in Paragraph 1.1.

J. Coal tar for field coated underground piping shall be self-priming, cold applied type by: Koppers Bitumastic 50.

K. Vapor barriers shall have a maximum permeance of 0.03 perm inches.

PART 3 - EXECUTION

3.1 GENERAL

A. Except as otherwise specified, material shall be installed in accordance with the manufacturer's written instructions.

B. Insulation materials shall not be applied until the following have been completed:
1. Rust, scale, dirt and moisture removed from surfaces to be insulated.
2. Required tests

C. Insulation shall be kept clean and dry. If insulation becomes wet, the insulation shall be removed from the jobsite and replaced with new.

D. Repair existing insulation to the extent damaged by new work.

E. Seal all vapor barrier joints, breaks, and punctures with tape.

3.2 FIBERGLASS BLANKET INSULATION

A. Overlap edges 2" (50 mm) and secure insulation with wire 12" (300 mm) on center. For ducts over 36" (915 mm) wide, insulation shall be secured to the underside of duct with mechanical fasteners 18" (460 mm) on center in both directions.

B. Seal joints, breaks, and punctures with tape for all supply duct vapor barriers.

3.3 DUCT LINER

A. Adhere liner to inner surface with 100% coverage of sprayed on fire retardant adhesive. Secure with weld pins with spacing in accordance with SMACNA Duct Liner Applications Standards.

B. Factory or field coat exposed edges of liner.

END OF SECTION 23 52 50

SECTION 23 56 52

SINGLE PACKAGED AIR-CONDITIONING EQUIPMENT

PART 1 - GENERAL

1.1 RELATED WORK

A. Motors and starters shall be as indicated in Section MECHANICAL GENERAL.

B. Vibration isolators shall be as indicated in Section MECHANICAL GENERAL.

1.2 WARRANTY

A. Equipment provided under this Section shall be provided with a parts and labor warranty, including refrigerants and lubricants, for 1 year after date of substantial completion.

B. Compressors shall be furnished with the manufacturer's 5-year warranty, i.e., a 4-year extended warranty in addition to the standard 1-year warranty.

1.3 SUBMITTALS

A. Submit product information for air-conditioning equipment to the Architect in accordance with Division 1 and Section MECHANICAL GENERAL.

PART 2 - PRODUCTS

2.1 GENERAL

A. Refer to equipment schedule for performance criteria. Refer to RTU Schedule and HVAC Controls specification for additional control requirements.

B. Units shall be UL listed.

C. All moving parts shall be protected with factory installed metal guards. Rotating parts shall be statically and dynamically balanced at the factory.

D. Portions of equipment exposed to the weather shall be constructed of heavy gauge galvanized steel with a factory weatherproof finish.

E. Coils shall be constructed of copper tubes and aluminum fins mechanically bonded to the tubes.

F. Units shall be provided with oil filter and oil level sight glass, suction line accumulator, and relief valve or fusible plug.

G. Units shall be furnished with factory refrigerant precharge.

2.2 ROOFTOP AIR-CONDITIONING UNITS

A. General Description: Units shall be factory-assembled and tested, designed for roof installation, and consisting of compressors, condensers, evaporator coils, condenser and evaporator fans, refrigeration and temperature controls, motor controllers, filters, dampers and gas-fired heating section. Units shall be provided with single point power connection. Capacities and electrical

characteristics are scheduled on the Drawings.

B. Casing: manufacturer's standard casing construction, having corrosion protection coating, and exterior finish. Casings shall have removable panels or access doors for inspection and access to internal parts, a minimum of 1/2" thick thermal insulation in compliance with NFPA 90A, knockouts for electrical and piping connections, an exterior condensate drain connection and lifting lugs. Condensate drain pan shall be sloped to conform to ASHRAE Standard 62.

C. Evaporator fans: forward-curved, centrifugal, belt-driven fans with adjustable sheaves; and permanently lubricated motor bearings. Extended grease lines shall allow greasing of bearings from outside the fan section.

D. Condenser fans: propeller-type, direct-driven fans with permanently lubricated bearings.

E. Filters: MERV-13 Rated, Disposable

F. Coils:
1. General: Aluminum plate fin and seamless copper tube type. Fins shall have collars drawn, belled and firmly bonded to the tubes by means of mechanical expansion of the tubes. No soldering or tinning shall be used in the bonding process. Coils shall have a galvanized steel casing. Coils shall be mounted in the coil casing with same end connections accessible for service. Coils shall be removable from the unit through the roof or through the piping enclosure. Coil section shall be completely insulated.
2. Refrigerant cooling coils: have an equalizing type vertical distributor to ensure each coil circuit receives the same amount of refrigerant. Coils shall be proof (450 psig) and leak (300 psig) tested with air pressure under water, then cleaned, dehydrated, and sealed with a holding charge of nitrogen.

G. Compressors: serviceable, scroll or reciprocating compressors, complete with integral vibration isolators. Provide crankcase heaters as required. Each unit shall be provided with the maximum number of compressors or capacity steps available. Refer to the scheduled basis of design for minimum steps of capacity.

H. Safety controls: manual reset type for:
1. Low pressure cutout.
2. High pressure cutout.
3. Compressor motor overload protection.

I. Accessories: Units shall include the following additional accessories:
1. Compressor cycle delay: Time delay before successive starts for each compressor.
2. Electronic programmable thermostat. All thermostats shall have capability of night setback.
3. Automatic head pressure control for operation down to 50° F.

J. Rooftop air-conditioning units shall be manufactured by JCI/York, Carrier, Rheem or Trane.

PART 3 - EXECUTION

3.1 Units shall be installed as indicated and as recommended by the manufacturer.

END OF SECTION 15652

SECTION 23 58 90

AIR DISTRIBUTION SYSTEM

PART 1 - GENERAL

1.1 QUALITY ASSURANCE

A. Air distribution systems, equipment, and installation shall be in accordance with the following codes and standards:
1. NFPA 90A Installation of Air Conditioning and Ventilating Systems.
2. ARI 650 Air Outlets and Inlets
3. SMACNA HVAC Duct Construction Standards.
4. ASHRAE 70 Method of Testing for Rating the Air Flow Performance of Outlets and Inlets

1.2 RELATED WORK

A. Ductwork liner shall be furnished and installed as indicated in Section 23 5250, MECHANICAL INSULATION.

1.3 SUBMITTALS

A. Submit product information to the Architect in accordance with Division 1 and Section 23 5010 MECHANICAL GENERAL for the following:
1. Flexible ductwork.
2. Manual dampers.
3. Grilles, registers and diffusers.

PART 2 - PRODUCTS

2.1 DUCTWORK

A. Duct sizes shown are inside clear dimensions.

B. Ducts shall be constructed of galvanized steel sheets of lock-forming quality, unless indicated otherwise.

C. Elbows shall be radius elbows constructed with inside radius equal to the duct width. Provide square type with double thickness turning vanes where required by restricted space conditions.

D. Slope of transitions shall not exceed 1 inch of transition per 7 inches of length on any side for expansions; 1 inch of transition per 4 inches of length on any side for contractions.

E. Duct pressure classifications:

Class (in. w.g.)	Type Ductwork
2	Ductwork from constant volume air handling units to grilles, registers or diffusers.
½	Ductwork on the discharge side of exhaust and return fans.
½	Ductwork on the inlet side of constant volume air handling units.

F. Duct construction:
1. Construct ductwork of galvanized steel in accordance with SMACNA HVAC Duct Construction Standards, except as specified otherwise.

2.2 DUCTWORK ACCESSORIES

A. Duct sealants shall be UL listed and shall comply with NFPA 90-1996. Sealants shall not contain asbestos.

B. Draw bands shall be nylon type and shall comply with UL 181-1990, Class 1, and NFPA 90A-1996.

2.3 DUCT ACCESS PANELS

A. Duct access panels shall be hinged, gasketed type. Access panels for ducts requiring insulation shall be double wall insulated type.

B. Duct access panels shall be: Air Balance, Krueger, Louvers & Dampers, National Controlled Air, Phillips-Aire, Ruskin, Nailor Industries, or Ventlok.

2.4 FLEXIBLE DUCTWORK

A. Duct shall consist of fabric or metalized polyester supported by helically wound steel spring wire. Ducts shall be insulated with 1" flexible glass fiber insulation and vapor barrier jacket. Duct shall comply with UL 181-1990 Class 1, and NFPA 90A.

B. Duct to diffusers shall be rated for minimum 6" positive pressure and 0.75" negative pressure.

C. Flexible ductwork shall be: Flexmaster, Flexmold, Genflex, Thermaflex, or Wiremold.

2.5 FLEXIBLE CONNECTIONS

A. Flexible connections for connecting ductwork to fans or fan sections shall be constructed of galvanized metal collar frame attached to neoprene impregnated glass cloth.

B. Flexible connections exposed to the weather shall be constructed of at least two layers of fabric, and shall be watertight.

2.6 SPIN-IN COLLARS

A. Spin-in collars shall be constructed of minimum 26 gauge galvanized steel with manual butterfly damper and no air scoop.

2.7 MANUAL DAMPERS

A. Dampers shall be constructed of single thickness minimum 16 gauge galvanized metal or extruded aluminum airfoil blades (maximum 8" width) secured to 1/2" diameter pivot rod, mounted in a galvanized steel frame. Maximum damper width shall be 42"; larger dampers shall consist of multiple sections assembled into one device. Bearings shall be molded synthetic or bronze sleeve, steel ball type.

B. Dampers shall be single blade butterfly type in ducts up to and including 18"x12" size; for ducts larger than 18"x12", in either or both dimensions, the dampers shall be the multi-louver opposed blade type with blade spacing not exceeding 6".

C. Balancing device shall be cadmium-plated steel quadrant with locking device and damper position indicator.

2.8 GRILLES, REGISTERS AND DIFFUSERS

A. Grilles, registers and diffusers shall be the types as scheduled on the drawings.

B. Grilles and registers for plaster or gypsum board mounting shall be provided with gaskets adhered to the concealed side of border trim.

C. Grilles registers and diffusers mounted in ceilings shall be provided with a factory applied, white, baked enamel finish. Grilles registers and diffusers mounted on exposed galvanized ductwork shall be provided with metal/silver finish.

D. Coordinate specific mounting requirements for grilles, registers and diffusers at each ceiling type indicated on the architectural drawings. Diffusers shall be drop face type for tegular tile ceiling areas.

E. Diffuser pattern shall be 4-way throw unless indicated otherwise.

F. Grilles, registers and diffusers shall be manufactured by Anemostat, Carnes, Krueger, Metal*Aire, E.H. Price, Titus, or Tuttle & Bailey unless indicated otherwise.

PART 3 - EXECUTION

3.1 DUCTWORK

A. Ductwork, including hangers and supports, shall be installed in accordance with SMACNA standards.

B. Ductwork as indicated is diagrammatic only. Provide offsets as required to coordinate with other trades. Provide transitions from equipment to duct sizes indicated.

C. Seal ductwork in accordance with SMACNA HVAC Duct Construction Standards. All ductwork shall have seams and joints sufficiently connected or sealed to eliminate air leakage that is detectable by hand or ear.

D. Ductwork that is not reinforced sufficiently to prevent rumbling during any operating condition shall be provided with additional reinforcement until the noise is undetectable.

E. Horizontal ductwork shall be supported from structure at not more than 8’ intervals and at each elbow.

F. All equipment connected to the ductwork shall be supported independently from structure.

3.2 GRILLES, REGISTERS AND DIFFUSERS

A. Secure grilles and registers to plaster or gypsum board with screws around the perimeter spaced every 18" on center per side.

3.3 DUCT ACCESS PANELS

A. Panel size shall be 20"x14" or for ducts greater than 20" wide and duct width minus 2" (square) for ducts 20" wide and smaller. For ducts smaller than 8", provide a removable duct section at required access panel locations.

B. Duct access panels shall be provided at each of the following locations:
   1. Duct smoke detectors
   2. Control dampers.
   3. Locations indicated on the drawings.

3.4 FLEXIBLE CONNECTIONS

A. Provide standard flexible connections at:
   1. Inlet and outlet of fans.
   2. Duct connections to packaged A/C units.

A. Flexible connections shall be installed such that metal portions of connector are separated by 2" on all sides.

3.5 FLEXIBLE DUCTWORK

B. Flexible duct runouts to diffusers shall not exceed 6 feet. Flexible duct to terminal units shall not exceed 3 feet. Longer runouts shall be constructed of round galvanized sheet metal of the same size.
   1. Flexible duct shall be connected with screw-driven, slotted stainless steel bands or ratcheted nylon straps.

B. Flexible duct sizes shall be equal to the connected terminal or device unless noted otherwise.

C. Where flexible duct takeoffs from rectangular ducts are indicated, connect to rectangular duct with bellmouth fittings.

D. Flexible duct runouts shall not be installed in areas with exposed ceilings. Runouts over ceilings shall be concealed from adjacent areas that are exposed ceiling spaces.

END OF SECTION 23 58 90

SECTION 24 59 50

HVAC CONTROLS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide a complete system of automatic controls for the package air conditioning unit as scheduled. The system shall consist of electric, electronic and DDC devices, and shall be manufactured by the RTU equipment manufacturer.

B. The existing controls system for AHU-1 shall be modified as indicated on the drawings. Adjustment to the system operation, including the new variable speed drive, existing chilled water coil, outside air dampers and return air dampers shall be included for operation of the system at a variable air volume and constant discharge air temperature and for a demand controlled ventilation system.

C. In addition to devices and materials indicated under PART 2, provide all devices and materials required to effect the sequences of operation.

D. Provide wiring, 120V and lower, required to effect the sequences of control and interlocks specified under this Division. This shall include 120 volt and lower power and control wiring serving electric damper and valve operators, including variable volume terminal units. Wiring shall originate at the HVAC control panels, from the motor starter of the interlocked equipment, or from a spare circuit in a 120 volt electrical panel. All circuiting shall be in accordance with specification sections referenced under the Electrical Division.

1.2 RELATED WORK

A. The following shall be provided as indicated under another Division:
1. Motor starters, unless factory installed with equipment.
2. Thermal overload switches.
3. Primary power wiring for mechanical equipment.

B. Duct smoke detectors shall be provided with the control system for RTU shutdown requirements.

C. Coordinate the installation of control dampers, and sensors in the piping and ductwork.

1.3 SUBMITTALS

A. Submit a complete separate wiring diagram for each system for approval. Submittal shall include the following as a minimum:
1. Data sheets on all devices to be utilized.
2. A diagram showing control wiring and devices with terminal designations, normal position of dampers, and location of devices including remote elements.
3. Detailed description of the operation of the control system using device designations as shown on the control diagram.

B. Submit product information for controls to the Architect in accordance with Division 1 and Section 23 5010 MECHANICAL GENERAL.

1.4 COORDINATION WITH TESTING AND BALANCING

A. The control system shall be tuned after all air-system balancing has been completed and the test and balance report has been submitted.

1.5 OPERATION AND MAINTENANCE MANUALS

A. Provide 3 copies of operation and maintenance manuals for the control system. The manuals shall include:
1. Step-by-step procedures control system startup, operation, and shutdown.
2. Control drawings.
3. Equipment data.
4. Maintenance procedures.
5. Spare parts data.
6. Recommended repair methods.
7. DDC: Instructions for using the control software.

PART 2 - PRODUCTS

2.1 WIRING

A. Provide 24 volt power wiring to electric actuators. Electric actuators specified herein are indicated as 24 volt. At Contractor's option, 120 volt actuators may be provided at no additional cost to the owner. Coordinate wiring requirements with the Electrical Division.

2.2 ACTUATORS

A. Electric actuators shall be 24 volt type actuator providing complete modulating control for the full range of device movement, with solid state controller, maximum/minimum settings, and reversing feature.

2.3 SENSORS

A. Temperature sensors: microprocessor-based unit consisting with temperature display, occupany adjustment (programmed by the DDC system) and occupant override of RTU system schedule.

B. CO2 sensors: microprocessor-based unit consisting of a photo-acoustic CO2 sensor. The CO2 sensor shall have a measuring range of 0 to 2000 ppm with a tolerance of ±200 ppm. Wall-mounted sensors shall have an off-white enclosure similar in appearance to the room sensors.

2.4 CONTROL DAMPERS

A. Control dampers shall be factory assembled with 16 gauge galvanized steel blades, or extruded aluminum blades, airfoil shape, galvanized steel frames, compressible neoprene or extruded vinyl blade seals, and compressible metal jamb seals.

B. Dampers up to 8" high shall be single blade. Dampers above 8" high shall be multiblade. Maximum length of section in parallel to blade shaft shall be 42".

C. Dampers shall be rated for less than 10 cfm per square foot leakage at 1" wg static pressure.

D. Dampers shall be opposed blade configuration for balancing and modulating applications. Dampers shall be parallel blade configuration for 2-position and where indicated on the Drawings.

PART 3 - EXECUTION

3.1 TRAINING

A. A training course shall be provided for maintenance personnel designated by the Owner to provide instruction on maintenance and operation of the system, including specified hardware and software.

B. The course shall be taught at the project site. The training course shall cover at a minimum:
1. Material contained in the Operating and Maintenance Instructions.
2. Layout and location of each HVAC control panel.
3. Programming, setpoint adjustments, alarm limit adjustments.
4. Preventive maintenance, troubleshooting, diagnostics, calibration, adjustment, commissioning, tuning, and repair procedures.

3.2 MAINTENANCE AND SERVICE

A. Services, materials and equipment shall be provided as necessary to maintain the entire system in an operational state as specified for a period of 1 year after successful completion and acceptance of the building. Impacts on facility operations shall be minimized.

3.3 TESTS

A. Each system upon completion shall be tested in the presence of the Architect and shall be shown to be in satisfactory condition. During this test period, the Controls Contractor shall make all necessary adjustments. General operating tests shall cover such time as is necessary to demonstrate that the entire equipment is functioning in accordance with specifications. Controls Contractor shall furnish all instruments, test equipment and personnel that are required for tests. It will be the Controls Contractor's responsibility to schedule the above tests with the Architect.

3.4 CONTROL DAMPERS

A. Install dampers in accordance with manufacturer’s instructions to operate and to obtain leakage rates specified. Adjust the damper linkage so that the damper closes before the actuator is fully closed to assure tight shutoff of the damper. Blank-off and seal around dampers and between dampers and sleeves or frames to eliminate air bypass.

B. Provide multiple damper actuators for large dampers, maximum 15 square foot of damper area per actuator.

END OF SECTION 24 59 50

SECTION 26 05 00

BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 DESCRIPTION AND DEFINITIONS

A. This division of the Specifications covers the complete electrical systems as indicated on the drawings or as specified herein. Provide all equipment, materials, labor, and supervision to install electrical systems. The requirements of this Section apply to all electrical work hereinafter described. The General and Special Conditions are considered a part of this Division of the Specifications and all provisions contained therein which affect this work are as binding as though incorporated herein.

B. The following words and phrases shall be interpreted as indicated:
1. "approved": approved or accepted by Governing Officials or Authorities Having jurisdiction
2. "materials": equipment and/or materials
3. "or equal/or equivalent": an equivalent with respect to appearance or function as determined by the Architect/Engineer; submittal approval may be required - refer to individual specification sections
4. "provide": furnish, install, connect, and test the operation thereof
5. "work": materials provided - see above definitions
6. "wiring": conductors/cabling and raceway system, including fittings, boxes, connectors, supports, hardware, labeling, and related accessories

1.2 QUALITY ASSURANCE

A. All electrical work shall be in accordance with the latest locally adopted edition of the following codes and agency standards:
1. National Electrical Code, 2008 Edition, with Georgia Amendments.
2. The National Electrical Safety Code (ANSI C-2).
3. The Life Safety Code (NFPA 101).
4. Occupation Safety and Health Administration (OSHA).
5. Regulations of the local serving utility company regarding metering and service entrance.
6. Accessibility Codes: Americans with Disabilities Act Guidelines (ADA), and ANSI A117.1, and Georgia Accessibility Code.
7. International Building Code, with Georgia Amendments.
8. Georgia State Energy Code (based on CABO Model Energy Code).
9. Municipal or other locally enforced ordinances governing electrical work.

B. Material Standards: All material shall conform to the standards where such standards have been established for the particular material indicated. Publications and standards of the organizations listed below are applicable to materials specified herein.
1. American National Standards Institute (ANSI)
2. Insulated Cable Engineers Association (ICEA)
3. Institute of Electrical and Electronic Engineers (IEEE)
4. National Electrical Manufacturers Association (NEMA)
5. National Fire Protection Association (NFPA)
6. Underwriters' Laboratories, Inc. (UL)

C. Listing and Labeling: Provide equipment assemblies 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.

1.3 PERMITS

A. Obtain all permits and inspections for the installation of this work and pay all charges incident thereto. Deliver to the Owner all certificates of said inspection issued by authorities having jurisdiction.

1.4 WARRANTY

A. The Contractor warrants to the Owner and Architect that materials and equipment furnished under this Contract will be of good quality and new unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects not inherent in the quality required or permitted, and that the Work will conform with the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by modifications not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear under normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. Refer to Division 1 for other warranty requirements.

1.5 PROJECT DOCUMENTS

A. Keep on hand at the project site a complete set of all project drawings and specifications, including, but not limited to, all architectural and engineering drawings. Refer to these documents as necessary; coordinate and install all work accordingly so that all electrical equipment will be properly located and accessible.

B. The drawings are diagrammatic and are intended to indicate the arrangements of electrical equipment. Do not scale drawings. Obtain dimensions for layout of equipment from drawings of other trades unless indicated on Electrical plans. Review drawings of other trades for door swings, cabinets, counters, and built-in equipment; conditions indicated on Architectural plans shall govern. Coordinate installation of electrical equipment with structural system and mechanical equipment and access thereto. Coordinate installation of electrical equipment with ductwork and piping, and wall thickness. Verify construction dimensions at the site and make changes necessary to conform to the building as constructed. Work improperly installed due to lack of construction verification shall be corrected at no additional cost to the Owner.

C. Equipment layout is based on one manufacturer's product. Where equipment selected by the Contractor for use on the project differs from layout indicated, the Contractor shall be responsible for coordinating space requirements and connection arrangements.

D. Bring all discrepancies shown on different drawings, between drawings and specifications or between documents and field conditions to the immediate attention of the Architect.

1.6 SUBMITTALS

A. Shop Drawings and Product Data:
1. Submit for review by the Architect data for materials and equipment to be used on the project. Submittals shall be supported by descriptive material, catalog cuts, diagrams, and performance charts published by the manufacturer to show conformance to specification and drawing requirements. Model numbers alone will not be acceptable. Provide documentation of complete electrical characteristics for all equipment.
2. Provide equipment layout plans, drawn to ¼”=1’-0”, showing the space arrangement of electrical spaces such as main service equipment area, electrical closets, and each area

where electrical distribution equipment is to be installed. Base layout on dimensions of the equipment actually submitted for use on the project. Submit plans for review with shop drawings.

3. Refer to the individual sections for indication of equipment for which submittals are required.
4. Refer to Division 1 for additional information on submittal requirements.

B. Record Documents: Refer to Division 1 for requirements for record documents, as-built drawings, and related submittals.

1.7 EQUIPMENT REQUIRING ELECTRICAL SERVICE

A. Review all specification sections and drawings for equipment requiring electrical service. Provide service to and make connections to all equipment requiring electrical service.

B. Drawings indicate equipment with loads, horsepowers, voltages, and corresponding control equipment, feeders, and overcurrent devices which were used as a basis for design. If equipment actually furnished have loads other than those indicated on the drawings or specified herein, control equipment, feeders, and overcurrent devices shall be adjusted in size accordingly at no additional cost to the Owner. Such adjustment shall be subject to the review of the Architect.

C. Incidental items not indicated on the drawings or mentioned in the specifications but that can legitimately and reasonably be inferred to belong to the work or be necessary in good practice to provide a complete system, shall be furnished and installed as though itemized here in detail.

1.8 MECHANICAL SYSTEMS INTERFACE

A. All control wiring and associated raceway systems for mechanical systems shall be provided under Divisions 21, 22, 24, and 25, unless otherwise shown on the Electrical drawings. Review Division 21, 22, 24, and 25 specifications, project drawings, and shop drawings for control systems to assure compatibility between equipment furnished under Division 26 and wiring furnished under Division 21, 22, 24, and 25.

B. Motor controllers (starters) shall be provided under Division 26, unless otherwise indicated to be provided under Division 21, 22, 24, and 25 as an integral component of Division 21, 22, 24, and 25 equipment.

C. Power wiring to all motors and controllers and between motors and controllers shall be provided under Division 26.

D. All electric heating equipment shall be provided and installed under Division 23. Power wiring to all electric heating equipment shall be provided under Division 26.

1.9 SITE INVESTIGATION

A. Prior to submitting bids for the project, visit the site of the work to become aware of existing conditions which may affect the cost of the project.

1.10 SCHEDULING OF OUTAGES OF EXISTING SERVICES

A. Electrical work requiring interruption of electrical circuits which would adversely affect the normal operation of the other portions of the Owner's property, shall be done at a time acceptable to the Owner. Schedule all work requiring interruption of electrical circuits at least two weeks prior to actual shutdown. Submit schedule in writing indicating extent of system to be de-energized, date and time when power is intended to be interrupted, and date and time power

will be restored. Schedule shall be subject to the review of the Architect and the Representative of the Owner.

1.11 RENOVATION AND DEMOLITION WORK

A. Where work under this project requires extension, relocation, reconnections or modifications to existing equipment or systems, the existing equipment or systems shall be restored to their original condition, with the exception of the work under this Contract, before the completion of this project. Work involves necessary interface with, and refit of, the existing installation, and the installation of new materials to provide finished work as indicated. Whether or not shown by the plans, existing materials serving renovation spaces, or routed through the renovation spaces, but not involved in the renovation work, and not otherwise specified or indicated by the plans for removal, shall be retained without change. Work shall be provided as necessary to tie-in the new installation with the existing installation, and to adapt the existing installation to systems or building changes.

B. Any necessary temporary connection or service shall be provided and performed in such manner as to maintain operation in all building areas. Systems or materials which are to remain in service, but are temporarily disconnected, shall be reconnected and restored to their original operating condition.

C. Perform work on a schedule as necessary to interface with other trades.

D. The ratings, location and usage of any existing material or circuit indicated or otherwise involved in the work shall be field verified.

E. Before using or adding to any existing electrical circuit, verify the existing circuit capacity, and do not make any connection that would overload any circuit or improperly use any existing circuit. Before removing any existing circuit, check all connected loads to assure that there are no unknown existing loads that should remain connected - do not remove any existing circuit where existing loads to remain would be permanently disconnected.

F. Exposed wiring rendered useless due to changes in the building shall be removed. Concealed wiring and controls exposed by the removal of walls, partitions, etc., shall be removed or relocated and reconnected as necessary or as indicated.

G. Existing materials that are not reused shall be removed where possible without interfering with other material, unless otherwise specified or indicated to be abandoned in place. Where abandoned in place, wiring or other material shall be disconnected and secured so as not to be mistaken for active material or to contribute to a potentially unsafe condition.

H. Materials to be relocated or salvaged shall be disconnected and removed without damage. Removed materials shall be stored at the job site under the best conditions practical. Materials to remain in place while work is in progress shall be disconnected if necessary to function or for safety, and protected by appropriate means.

I. Existing materials may not be reused unless otherwise stated or specified. Existing material that is removed and not identified for salvage or reuse shall become the property of the Contractor and shall be removed from the premises. Existing materials which shall be removed and returned to the Owner shall be as listed on the drawings or as otherwise indicated. Disposal of fluorescent lamps shall comply with Federal Environmental Protection Agency guidelines and any other applicable locally enforced hazardous waste requirements.

J. Where systems are added to, new material shall be of the same type, style and manufacture as the existing system material, where available.

K. Electrical cable or conductors damaged or removed from raceways shall not be reused.

L. Communications cabling not indicated to be reused shall be removed from the project site. Coordinate with the Owner’s telecommunications representatives to confirm abandoned/unused cabling prior to removal.

M. Work shall be performed within the access, proprietary, security, and housekeeping conditions specified herein, by other Divisions or Sections of the specifications, in the General Conditions, Special Conditions, Instructions to Bidders, or by Owner's criteria.

N. Notify the Owner's representative of any nonfunctioning material or potentially unsafe condition within the existing systems that is observed during the conduct of the work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Furnish all materials specified herein or indicated on the drawings. All materials shall be new, unless otherwise indicated.

B. Where Underwriters' Laboratories (UL) testing standards and listings exist for an item of material or equipment, the listed material shall bear the UL label.

PART 3 - EXECUTION

3.1 PRODUCT DELIVERY, STORAGE, HANDLING, AND PROTECTION

A. Inspect materials upon arrival at site and verify conformance with project requirements. Prevent unloading of unsatisfactory material. Handle materials in accordance with applicable standards and recommendations, and in a manner to prevent damage to materials. Store packaged materials in original undamaged condition with manufacturer's labels and seals intact. Containers which are broken, opened, damaged, or watermarked are unacceptable and shall be removed from the premises and replaced.

B. All material, except items specifically designed to be installed outdoors, shall be stored in an enclosed, dry building or trailer. Areas for general storage shall be provided. Provide temperature and/or humidity control where necessary. All material for interior installation, including conductors, shall be stored in an enclosed weathertight structure and shall be protected from water, direct sunlight, cold or heat. Equipment stored other than as specified above shall be removed from the premises and replaced.

C. Equipment and materials shall not be installed until such time as the environmental conditions of the job site are suitable to protect the equipment or materials. Conditions shall be those for which the equipment or materials are designed to be installed.

3.2 CLEANING, PAINTING, AND IDENTIFICATION

A. Remove oil, dirt, grease and foreign materials from all raceways, boxes, panelboard trims and cabinets to provide a clean surface for painting. Touch-up scratched or marred surfaces of lighting fixtures, panelboard and cabinet trims, or other equipment enclosures with paint furnished by the equipment manufacturer specifically for that purpose.

B. Where painting of trim covers for flush mounted panelboards, communication equipment cabinets, pull boxes, junction boxes, and control cabinets is required under this or any other Division of

these specifications, remove trim covers before painting. Do not paint locks, latches, hinges, or exposed trim clamps.

C. Where plywood backboards are used to mount equipment provided under Divisions 26, 27, or 28, paint backboards with two coats of light gray paint. Provide fire-retardent plywood, 3/4" thick minimum.

D. Identify electrical components where required in the individual specification sections.
1. Equipment connected to utility power shall have black faced nameplates. Equipment connected to emergency power shall have red faced nameplates
2. Nameplates shall be constructed from laminated phenolic engraved plastic three-ply with a white interior core at least 1/16 inch thick.
3. Plastic strips shall be stamped, pressure-sensitive adhesive type labels, with white letters.
4. Stencils shall be machine cut with 1/4-inch high minimum size letters. Paint shall be enamel or lacquer type. Unless otherwise indicated, labeling shall use condensed gothic letters and arabic numerals properly spaced for easy and legible reading.
5. Nameplates for surface mounted equipment shall be installed on the exterior, and for flush or recessed mounted equipment shall be installed on the inside of the door or cover with epoxy cement adhesive, unless otherwise indicated.

3.3 COORDINATION AND COOPERATION

A. Schedule the work, coordinate, and cooperate with all trades to avoid interferences, delays, and unnecessary work. If any conflicts occur which, in the installer's opinion, necessitate departures from the drawings and specifications, details of departures and reasons therefore shall be submitted in writing for the Architect's consideration.

B. Notify other trades of dedicated electrical space to ensure those spaces stay clear of pipes, duct work and other foreign systems.

3.4 OPERATION AND MAINTENANCE MANUALS AND INSTRUCTIONS

A. Provide printed material for binding in operation and maintenance manuals. Include electrical equipment shop drawings as a minimum, and other information as necessary. Refer to Division 1 for additional information on submittal requirements.

B. Instructions of Owner Personnel:
1. Before final project review, as designated by the Architect, provide a competent representative to instruct Owner's designated personnel in systems indicated.
2. Use Operation and Maintenance Manuals as basis of instruction. Review contents with personnel in detail to explain all aspects of operation and maintenance.
3. Prepare and insert additional data in Operation and Maintenance Manuals when the need for such data becomes apparent during instruction.

3.5 ELECTRICAL ACCEPTANCE TESTS AND MANUFACTURERS CERTIFICATION

A. Refer to the individual specification sections and the Electrical Acceptance Testing section for equipment or system test requirements. Testing documentation shall be provided for reference at the time of final project review.

B. Where specified under the individual system specification sections, the systems shall be reviewed for compliance with these specifications, installation in accordance with the manufacturer's recommendations, and system operation by a representative of the manufacturer. The manufacturer shall submit certification that the system has been reviewed by the manufacturer, is installed in accordance with the manufacturer's recommendations, and is operating in accordance with the specifications.

3.6 CONSTRUCTION OBSERVATION ASSISTANCE

A. Provide personnel to assist the Architect or his representative during all construction observation visits. Provide tools and equipment as required to demonstrate the system operation and provide access to equipment, including screwdrivers, wrenches, ladders, flashlights, circuit testing devices, meters, keys, etc.

B. Remove panelboard trims, motor controls covers, device plates, junction box covers, etc. as directed for inspection of internal wiring. Turn over to the Owner one set of keys for all lockable electrical equipment on the project. Accessible ceilings shall be removed as directed for inspection of equipment installed above ceilings.

C. Energize and de-energize circuits and equipment as directed. Demonstrate operation of equipment and systems as directed.

D. Provide authorized representatives of the manufacturers to demonstrate to the Architect compliance with the Contract Documents at a time designated by the Architect.

END OF SECTION 26 05 00

SECTION 26 05 19

WIRES AND CABLES

PART 1 - GENERAL

1.1 DESCRIPTION

A. The work required under this section of the specifications consists of the furnishing, installation and connection of the building wiring system. Exterior branch circuit wiring and feeder conductors extended beyond the building are included. Wiring systems for communication and other signaling systems are not included in this section unless specified to be included, by reference, in the respective specification sections for these systems.

1.2 QUALITY ASSURANCE

A. Industry Referenced Standards. The following specifications and standards are incorporated into and become a part of this Specification by reference.
   1. Underwriters' Laboratories, Inc. (UL) Publications:
      a. No. 44 Rubber - Insulated Wire and Cables
      b. No. 83 Thermoplastic - Insulated Wires
      c. No. 493 Thermoplastic - Insulated Underground Feeder and Branch Circuit Cables
      d. No. 486 Wire Connectors and Soldering Lugs
      e. No. 486A Wire Connectors and Soldering Lugs for Use with Copper Conductors.
      f. No. 486C Splicing Wire Connectors.
      g. No. 486D Insulated Wire Connectors for Use With Underground Conductors.
   2. Insulated Cable Engineers Association (ICEA) Standards:
      a. S-61-402 Thermoplastic Insulated Wire and Cable
   3. National Electrical Manufacturers' Association (NEMA) Standards:
      a. WC-5 Thermoplastic Insulated Wire and Cable
   4. National Fire Protection Association (NFPA) Publications:
      a. No. 70 National Electrical Code (NEC)
   5. Institute of Electrical and Electronics Engineers (IEEE) Standards:
      a. No. 241 IEEE Recommended Practice for Electric Power Systems in Commercial Buildings.
      b. No. 404 Standard for Power Cable Joints.
   6. American Society for Testing and Materials (ASTM):
      a. No. B3 Soft or Annealed Copper Wire.
      b. No. B8 Concentric Lay Stranded Copper Conductors, Hard, Medium-Hard, or Soft.
      c. No. B33 Tinned Soft or Annealed Copper Wire for Electrical Purposes
      d. No. B172 Rope Lay Stranded Copper Conductors, Having Bunch Stranded Members for electrical Conductors.
      e. No. B539 Standard Methods for Measuring Contact Resistance of Electrical Connections (Static Contacts).
   7. American National Standards Institute (ANSI) Standards:
      a. CC3 Connectors for use between aluminum or aluminum-copper overhead conductors.
      b. RS-364-21A Insulation Resistance Test.
      c. SG-14 Unplated split-bolt and Vice-Type Electrical Connectors for Copper Conductors.
   8. National Electrical Contractors' Association (NECA):
      a. Standards of Installation

B. Acceptable Manufacturers. Products by the following manufacturers which conform to this specification are acceptable.

1. Insulated cable - copper:
   a. Cablec
   b. Carol
   c. Okonite
   d. Southwire
   e. American Insulated Wire
   f. Rome
2. Mechanically applied (crimp) conductor terminations:
   a. Scotch (3M)
   b. Ideal
   c. Thomas and Betts (T&B)
   d. Burndy
3. Vinyl electrical insulating tape:
   a. Scotch (3M)
   b. Tomic
   c. Permacel
4. Twist-On Wire Connectors:
   a. Scotch (3M)
   b. Ideal
   c. Buchanan
5. Encapsulated insulating kits:
   a. Scotch (3M)
   b. Raychem
   c. Essex Group, Inc.
6. Portable cable fittings:
   a. Crouse Hinds
   b. Appleton
   c. Thomas and Betts (T&B)
7. Hydraulically applied conductor terminations:
   a. Square D
   b. Burndy
   c. Ilsco
   d. Scotch (3M)
   e. Thomas and Betts (T&B)
8. Metal-clad (MC) cable:
   a. Cablec
   b. Carol
   c. Okonite
   d. Southwire
   e. American Insulated Wire
   f. Rome
   g. AFC

PART 2 - PRODUCTS

2.1 GENERAL MATERIALS REQUIREMENTS

A. Provide all materials under this section of the specifications.

B. All wire and cable shall be UL listed and shall bear a UL label along the conductor length at intervals not exceeding 24 inches.

C. All conductors shall have size, grade of insulation, voltage and manufacturer's name permanently marked on the outer cover at intervals not exceeding 24 inches.

D. Conductor size shall be a minimum of No. 12 AWG, but shall not be less than indicated on the drawings.

E. Insulation voltage level rating shall be 600 volts.

2.2 MATERIALS DESCRIPTION

A. Conductors No. 10 AWG and smaller shall be solid copper, 90 degrees centigrade type THHN/THWN or XHHW, unless otherwise indicated on the drawings, required by the National Electrical Code or specified elsewhere in Division 16.

B. Conductors larger than No. 10 AWG shall be stranded copper, 90 degrees centigrade, type THHN/THWN, XHHW, unless otherwise indicated on the drawings, required by the National Electrical Code, or specified herein.

C. Lighting fixture wire shall be No. 16 AWG silicone rubber insulated, stranded fixture wire, type SFF-2 (150 degrees centigrade), or No. 16 AWG thermoplastic, nylon jacketed stranded fixture wire, type TFFN (90 degrees centigrade).

D. Portable power cables and outlets shall be provided where indicated on the drawings. Cables shall be sized as indicated on the drawings with equal size green equipment ground. #14/2 with ground may be used for connection to lighting fixtures. Cables shall be jacketed 600 volt SO type. Cable connectors shall be steel case liquid tight sized for cable diameter and shall use strain relief gland fitting to prevent tension on conductor terminations. Use wire mesh strain relief cable grips at both ends of cable. Use cast type outlet device box for device cable drops.

E. Splices and taps.
1. No. 10 AWG and smaller: Dry type connectors shall have live spring allowing reentry twist-off operation without damaging conductors. Connectors for solid conductors shall be solderless, screw-on, spring pressure cable type, 600 volt, 105 degree centigrade with integral insulation, UL approved for aluminum and copper conductors. Connectors for stranded conductors shall be crimp-on type with integral insulation cover.
2. No. 8 and larger: Hydraulically applied crimping sleeve or tap connector sized for the conductor or indent, split-bolt or bolt clamp-type connectors. Insulate the hydraulically applied connector with 90 degree centigrade, 600 volt insulating cover. Insulate the mechanically applied connectors with heat shrink insulator sleeve or plastic electrical insulating type. Insulator materials and installation shall be approved for the specific application, location, voltage and temperature.

F. General requirements for connections: For each electrical connection indicated, provide complete assembly of materials, including but not necessarily limited to, pressure connectors, terminals (lugs), electrical insulating tape, heat-shrinkable insulating tubing, cable ties, solderless wire-nuts, and other items and accessories as needed to complete splices and terminations of types indicated.

G. Connectors and Terminals: Provide electrical connectors and terminals which mate and match, including sizes and ratings, with equipment terminals which are recommended by equipment manufacturer for intended applications.

H. Electrical Connection Accessories: Provide electrical insulating tape, heat-shrinkable insulating tubing and boots, wirenuts and cable ties as recommended for use by accessories manufacturers for type services indicated.

I. Electrical insulating tape shall be 600 volt, flame retardent, cold and weather resistant, .85 mil thick minimum plastic vinyl.

2.1 MC CABLE OPTION

A. At the Contractor's option, metal-clad cable may be used for branch circuiting in areas with accessible ceilings and metal stud drywall partition construction or other areas as indicated on the plans, for 20A, 120V branch circuits except homeruns, where permitted by the National Electrical Code. Outer jacket shall be impervious metal sheath without an overall nonmetallic covering listed for use in environmental air plenums. Conductors shall be copper, minimum size No. 12, with THHN/THWN or XHHN insulation. Each cable shall contain an internal grounding conductor; the outer jacket shall not be used for the ground. Type AC cable, or BX, shall not be used. For circuits serving receptacles, the metal clad cable shall contain a neutral conductor sized 173% (minimum) of the phase conductor ampacity; or individual, dedicated, separate neutrals shall be provided for each branch circuit (i.e., no sharing of neutrals).

PART 3 - EXECUTION

3.1 EXECUTION

A. Install all wiring in raceway system, except where conductors are indicated or specified not to be installed in raceway. No conductors shall be installed into conduit until the conduit system is complete. Ideal #77, Carlon-Slikum, Burndy "Slikon", or other approved pulling compound shall be used when pulling conductors into conduit.

B. Do not install more conductors in a raceway than indicated on the drawings. A maximum of three branch circuits are to be installed in any one conduit, on a 3 phase 4 wire system, unless specifically indicated otherwise on the drawings. No two branch circuits of the same phase are to be installed in the same conduit, unless specifically indicated on the drawings.

C. Conductors shall be electrically continuous and free from short circuits or grounds. All open, shorted or grounded conductors and any with damaged insulation shall be removed and replaced with new material free from defects.

D. Color code all service, feeder, and branch circuit conductors. Control and signal system conductors need not be color coded. Phase conductors No. 10 and smaller shall have solid color compound insulation or color coating. Phase conductors No. 8 and larger shall have solid color compound, color coating or colored phase tape. Colored tape shall be installed on conductors in every box, at each terminal point, cabinet, pullbox or other enclosure. Grounded conductor (i.e., neutrals and equipment grounds) color coding shall comply with the National Electrical Code requirements. Coding shall be as follows:
   1. 208Y/120 volt three phase four wire system - Phase A: Black, Phase B: Red, Phase C: Blue, Neutral: White
   2. 480Y/277 volt three phase four wire system - Phase A: Brown, Phase B: Orange, Phase C: Yellow, Neutral: Gray
   3. Grounding conductors shall be green. Grounding conductors for isolated ground circuits shall be green with a yellow trace.

E. Maintain phase rotation established at service equipment throughout entire project.

F. Group and lace with nylon tie straps all conductors within enclosures, i.e. panels, motor controllers, and cabinets.

G. Support conductors installed in vertical raceways at intervals not exceeding those distances indicated in the National Electrical Code. Support conductors in pull boxes with bakelite wedge type supports provided for the size and number of conductors in the raceway.

H. Secure portable cables in accordance with the NEC. Install strain relief devices to prevent tension on terminations if cable is pulled. Install cable grips on drops and connect to outlet box or structure. Leave slack cable loop at drop point.

I. Connect all conductors. Install electrical connections as indicated, in accordance with equipment manufacturer's written instructions and with recognized industry practices, and complying with applicable requirements of Industry Referenced Standards.

J. Connect electrical power supply conductors to equipment conductors in accordance with equipment manufacturer's written instructions and wiring diagrams. Mate and match conductors of electrical connections for proper interface between electrical power supplies and installed equipment.

K. Cover splices with electrical insulating material of equivalent, or of greater insulation resistivity rating, than electrical insulation rating of those conductors being spliced.

L. Prepare cables and wires by cutting and stripping covering armor, jacket, and insulation properly to ensure uniform and neat appearance where cables and wires are terminated. Exercise care to avoid cutting through tapes which will remain on conductors. Also avoid "ringing" copper conductors while skinning wire.

M. Trim cables and wires as short as practicable and arrange routing to facilitate inspection, testing and maintenance.

N. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturers' published torque tightening values for equipment connectors. Tighten by utilizing proper torquing tools, including torque screwdriver, beam-type torque wrench, and ratchet wrench with adjustable torque settings. Where manufacturer's torquing requirements are not available, tighten connectors and terminals to comply with torquing values contained in UL Standards listed.

O. Terminate conductors No. 10 AWG and smaller specified to be stranded, with crimp type lug or stud. Direct termination of stranded conductors without crimp terminator to terminal screws, lugs, or other points is not permitted even if terminal is rated for stranded conductors. Crimp terminal shall be the configuration type suitable for terminal point.

P. Make connections between lighting fixture junction box and fixture with fixture wire.

Q. Make splices in conductors only within junction boxes, wiring troughs and other enclosures as permitted by the National Electrical Code. Do not splice conductors in pull boxes, panelboards, or disconnect switches.

R. Splices in conductors installed below grade are not permitted, unless indicated on the drawings. For taps and splices indicated on the drawings, connections shall be made in flush mounted watertight junction box with crimp connectors and watertight resin encapsulation kit.

3.2 FIELD QUALITY CONTROL

A. Upon completion of installation of electrical connections, and after circuitry has been energized with power source, test connections to demonstrate capability and compliance with requirements. Ensure that direction of rotation of each motor fulfills requirement. Correct malfunctioning units at site, then retest to demonstrate compliance.

3.3 MC CABLE

A. Where permitted elsewhere in these specifications, MC cable shall be supported as required by NEC Article 334, at intervals not exceeding six feet. Draping cable over ducts, pipes, etc., unsecured is not acceptable.

END OF SECTION 26 05 19

SECTION 26 05 26

GROUNDING

PART 1 - GENERAL

1.1 DESCRIPTION

A. The work required under this section of the specifications consists of the furnishing, installation, and connections of the project grounding systems. The project electrical system is a 3 phase, 4 wire grounded wye system supplemented with an equipment grounding system. Equipment grounding system shall be established with equipment grounding conductors; the use of metallic raceways for equipment grounding is not acceptable.

1.2 QUALITY ASSURANCE

A. Industry Referenced Standards. The following specifications and standards are incorporated into and become a part of this Specification by reference.
   1. Underwriters' Laboratories, Inc. (UL) Publications:
      a. Rubber-Insulated Wire and Cables
      b. Thermoplastic - Insulated Wires
      c. Electrical Grounding and Bonding Equipment
      d. Thermoplastic - Insulated Underground Feeder and Branch Circuit Cables
      e. Wire Connectors and Soldering Lugs
   2. National Electrical Manufacturers' Association (NEMA) Standards:
      a. WC-5 Thermoplastic Insulated Wire and Cable
      b. WC-7 Cross-Linked-Thermosetting
   3. National Fire Protection Association (NFPA) Publications:
      a. National Electrical Code (NEC)
   4. National Electrical Contractors' Association (NECA):
      a. Standards of Installation
   5. Bellcore (Telecordia) Standards:
      a. TR-NWT-000295 Isolated Ground Planes: Definition and Application to Telephone Central Offices

B. Acceptable Manufacturers. Products by the following manufacturers which conform to this specification are acceptable.
   1. Hydraulically applied conductor terminations:
      a. Burndy
      b. Ilsco
      c. Scotch/3M
      d. Thomas and Betts (T & B)
      e. Anderson
   2. Mechanically applied (crimp) conductor terminations:
      a. Scotch/3M
      b. Ideal
      c. Thomas and Betts (T & B)
      d. Burndy
   3. Exothermic connections:
      a. Erico/Cadweld
      b. Harger
      c. Thompson

PART 2 - PRODUCTS

2.1 GENERAL MATERIALS REQUIREMENTS

A. Provide all materials under this section of the specifications.

2.2 MATERIALS DESCRIPTION

A. Grounding Conductors
1. Equipment grounding conductors shall be green insulated type THW, THWN, or XHHW conductors sized as indicated on the drawings. Where size is not indicated on the drawings, conductor size shall be determined from the National Electrical Code table on sizes of equipment grounding conductors.
2. Grounding electrode conductors shall be bare or green insulated copper conductor sized as indicated on the drawings. Where size is not indicated on the drawings, conductor size shall be determined from the National Electrical Code table on sizes of grounding electrode conductors. Bonding jumpers shall be flexible copper bonding jumpers sized in accordance with the National Electrical Code tables for grounding electrode conductors.

B. Disconnect Switches, Transformers, and Motor Controllers: Provide a conductor termination grounding lug bonded to the enclosure of each equipment item.

C. Devices: Each receptacle and switch device shall be furnished with a grounding screw connected to the metallic device frame.

D. Ground Rods shall be 3/4" x 10'-0" copper clad steel.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Ground all non-current carrying parts of the electrical system, i.e., wireways, equipment enclosures and frames, junction and outlet boxes, machine frames and other conductive items in close proximity with electrical circuits, to provide a low impedance path for potential grounded faults. Metal raceways shall be electrically continuous throughout the entire system. Metal raceways into electrical equipment components and cabinets such as disconnect switches, panelboards, etc. shall be connected to the equipment grounding buses by means of grounding bushings. Connections of raceways that employ locknuts shall use two locknuts to insure grounding continuity. Heavy duty thermowelds shall be employed if connections are buried under floor slab or grade. Buried connections shall be painted with a corrosion-inhibiting material.

B. Equipment Grounding Conductors
1. Grounding conductors for branch circuits are not shown on the drawings; however, grounding conductors shall be provided in all branch circuit raceways. Grounding conductors shall be the same AWG size as branch circuit conductors, unless otherwise indicated. Grounding conductors for feeders are typically indicated on the drawings and the raceway is sized to accommodate grounding conductor shown. Where grounding conductor size is not indicated on the drawings, conductor shall be in accordance with the equipment grounding conductor table of the National Electrical Code.
2. A grounding conductor shall be installed in all flexible conduit installations. For branch circuits, grounding conductor shall be sized to match branch circuit conductors.
3. The equipment grounding conductor shall be attached to equipment with bolt or sheet metal screw used for no other purpose. Where grounding conductor is stranded, attachment shall be made with lug attached to grounding conductor with crimping tool.

4. Equipment grounding conductors shall be attached to outlet boxes with bolt or sheet metal screw used for no other purpose. Where grounding conductor is stranded, attachment shall be made with lug attached to grounding conductor with crimping tool. Connect equipment grounding conductor from wiring device outlet box to wiring device.
5. Ground all motors by drilling and tapping the bottom of the motor junction box and attaching the equipment grounding conductor to the box with a round head bolt used for no other purpose. Conductor attachment shall be through the use of a lug attached to conductor with crimping tool.
6. Equipment grounding conductors shall terminate on distribution equipment grounding bus only. Do not terminate on neutral bus. Provide a single terminal lug for each conductor. Conductor shall terminate in the same section as the phase conductors originate. Do not terminate neutral conductors on the ground bus.

C. Other Grounding Requirements
1. Lighting fixtures shall be grounded with a green insulated ground wire secured to the fixture with a UL listed bond lug, screw, or clip specifically made for such use.
2. Outlet boxes shall have grounding jumper connecting device and outlet box. Refer to the CONDUITS AND BOXES specification section.

3.2 FIELD QUALITY CONTROL

A. Upon completion of installation, test the installation in accordance with the ELECTRICAL ACCEPTANCE TESTING section of this specification. Grounding resistance reading shall be taken before connection is made to the building cold water piping system. Ground resistance readings shall not be taken within forty-eight hours of rainfall. Results of ground resistance readings shall be forwarded, in writing, immediately to the Architect. Remedy any deficient components of the grounding system, then retest to demonstrate compliance.

END OF SECTION 26 05 26

SECTION 26 05 33

CONDUITS AND BOXES

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section covers the complete conduit raceway system, including outlet boxes, junction boxes, and pullboxes.

B. Definitions: The term conduit, as used in this Specification, shall mean any or all of the raceway types specified. The following abbreviations are referenced in this section:
1. RGS Rigid Galvanized Steel
2. IMC Intermediate Metallic Conduit
3. EMT Electrical Metallic Tubing
4. "Box" includes all outlet, device, junction, and pull boxes

1.2 QUALITY ASSURANCE

A. Referenced Industry Standards: The following specifications and standards are incorporated into and become a part of this Specification by reference.
1. Underwriters' Laboratories, Inc. (UL) Publications:
   a. No. 1 Flexible Metal Electrical Conduit
   b. No. 6 Rigid Galvanized Conduit
   c. No. 467 Electrical Grounding and Bonding
   d. No. 651 Rigid Nonmetallic Electrical Conduit
   e. No. 797 Electrical Metallic Tubing
   f. No. 1242 Intermediate Metal Conduit
   g. Electric Cabinets and Boxes
   h. Electrical Grounding and Bonding Equipment
   i. Electrical Outlet Boxes and Fitting
2. American National Standards Institute (ANSI):
   a. C-80.1 Rigid Galvanized Conduit.
   b. C-80.3 Electrical Metallic Tubing.
3. National Fire Protection Association (NFPA):
   a. No. 70 National Electrical Code (NEC).
4. American Society for Testing and Materials (ASTM):
   a. A123 Zinc (Hot Galvanized) Coating on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strips.
   b. A153 Zinc (Hot Dipped) Coating on Iron and Steel Hardware.

B. Acceptable Manufacturers: Products of the following manufacturers, which comply with these specifications, are acceptable.
1. Metallic Conduit and Fittings:
   a. Appleton
   b. Crouse Hinds
   c. Killark
   d. O-Z/Gedney
   e. RACO
   f. Wheatland
   g. Allied
   h. Steel City, compression fittings
2. Support Channel:
   a. Kindorf

b. Unistrut
c. B-line

3. Non-Metallic Conduit and Fittings:
   a. Carlon
   b. Queen City
   c. Thomas & Betts
4. Galvanizing Compound:
   a. ZRC Products Company
5. Fire-rated foam sealant:
   a. Dow-Corning
6. Electrical tape:
   a. Scotch
   b. Tomic
   c. Permacel
7. Floor Boxes:
   a. FSR, Inc.
   b. Hubbell
   c. Steel City
   d. Walker/Wiremold.

1.3 STORAGE, HANDLING, AND COORDINATION

A. Refer to the BASIC ELECTRICAL REQUIREMENTS section of the specification for storage and handling requirements.

B. Non-metallic conduits stored on site prior to installation shall be stored on a surface off of the ground and shall be protected from direct sunlight and from construction debris.

C. Damaged, oxidized, warped, improperly stored material or material with excessive amounts of foreign debris shall be removed and replaced with new materials.

D. Coordination: Review architectural drawings for areas where outlets occur within specific architectural or structural features and install outlets as shown; or if not shown, accurately center and align boxes within the architectural features or detail.

PART 2 - PRODUCTS

2.1 GENERAL MATERIALS REQUIREMENTS

A. All conduit, fittings, and boxes shall be listed and bear a label by Underwriters' Laboratories (UL) for use as raceway system for electrical conductors.

B. Raceway is required for all wiring, unless specifically indicated or specified otherwise.

C. Size: The minimum size of conduit shall be 1/2". The size of all conduits shall be in accordance with the NEC, but not less than indicated on the drawings.

2.2 CONDUIT AND FITTINGS

A. Electrical Metallic Tubing: EMT couplings and connectors shall be steel water-tight and concrete-tight. Malleable iron, die cast or pressure cast fittings are not permitted. Fittings 2.0" and smaller shall be compression type or steel set screw type. Connectors for conduits 2.5" and larger shall be set screw type with four screws each. All connectors shall be insulated throat type.

B. Rigid Galvanized Steel and Intermediate Metallic Conduit: Fittings for RGS and IMC shall be standard threaded couplings, locknuts, bushings and elbows. All materials shall be steel or malleable iron only. Bushings shall be metallic insulating type consisting of insulating insert molded or locked into the metallic body of the fittings.

C. Non-Metallic Conduit: Non-metallic conduit shall be heavy wall, Schedule 40 PVC, unless otherwise indicated on the drawings. Non-metallic conduit fittings shall be of the same material as the conduit furnished and be the product for the same manufacturer.

D. Flexible Conduit
1. Flexible conduit shall be steel metallic type. Where specified herein, indicated on the drawings, or when used in damp or wet locations, as classified by the National Electrical Code, flexible conduit shall be liquid tight.
2. All flexible conduit shall be classified as suitable for system grounding.
3. Connectors for flexible conduit shall be steel insulated throat type rated suitable for system ground continuity. Connectors for liquid tight flexible conduit shall be screw-in ground cone type.
4. Flexible conduit use for other than connections to lighting fixtures shall not be less than 1/2" trade size and in no case shall flexible conduit size be less than permitted by the National Electrical Code for the number and size of conductors to be installed herein. 3/8" flexible conduit may be used for connection to lighting fixtures providing conduit fill requirements of the National Electrical Code are not exceeded.

E. Rigid Aluminum Conduit: Rigid aluminum conduit fittings shall be standard threaded couplings, locknuts, bushings, and elbows. Material shall be compatible with aluminum conduit of malleable iron, steel or aluminum alloy. Iron or steel fittings shall be zinc or cadmium plated. Aluminum fittings shall not contain more than 0.4 percent copper. Locknuts and bushings shall be as specified for RGS and IMC conduit.

2.3 MISCELLANEOUS CONDUIT FITTINGS AND ACCESSORIES

A. Electrical tape for corrosion protection shall be vinyl all-weather type.

B. Expansion and deflection couplings shall accommodate 3/4" deflection, expansion, or contraction in any direction and shall allow 30 degree angular deflections. Couplings shall contain an internal flexible metal braid to maintain raceway system ground continuity.

C. Fire and smoke stop materials shall be rock wool fiber, silicone foam, or silicone sealant, UL rated to maintain the fire floor or fire wall partition rating.

D. Corrosion-inhibiting coatings shall be cold-galvanizing compound type.

E. Conduit Supports
1. All parts and hardware shall be zinc-coated or have equivalent corrosion protection.
2. Conduit straps shall be single hole cast metal type or two hole galvanized metal type. Conduit clamps shall be spring steel type for use with exposed structural steel.
3. Conduit support channels shall be 1.5" x 1.5" x 14 gauge galvanized steel channel. Channel suspension shall be by threaded steel rods. Use swivel type connector to attach suspension rods to structure. Spring steel clips are not acceptable. Conduit straps shall be spring steel straps compatible with channel. Wire or chain is not acceptable for conduit hangers.
4. Individual conduit hangers shall be galvanized spring steel specifically designed for the purpose, sized appropriately for the conduit type and diameter, and have pre-assembled closure bolt and nut and provisions for receiving threaded hanger rod. Support with 1/4" threaded steel rod for individual conduits 1.5" and smaller and 3/8" rod for individual conduits 2.0" and larger.

5. Individual conduit straps on metal studs shall be spring steel and shall wrap around entire face of stud securely biting into both edges and have provisions for screwing into stud. Size for conduit to be supported. Tie wraps are not acceptable.
6. Support multiple conduits from metal studs using pre-assembled bar hanger assembly consisting of hanger bar, retaining clips and conduit straps.
7. Supports for 3/8" flexible conduit to lighting fixtures shall be secured to ceiling grid wire hangers with a metal clip specifically designed for this purpose. Caddy #PCS2. No other conduit shall be supported from the ceiling system.

2.4 BOXES

A. Boxes shall be as follows, unless otherwise specified, indicated on the drawings, or required by the NEC:
1. Sheet metal boxes of 50 cubic inches internal capacity and smaller shall be sheet steel, galvanized, with suitable covers and screws.
2. Sheet metal boxes larger than 50 cubic inches internal capacity shall be constructed of code gauge welded sheet steel, reinforced if required, and finished with standard gray enamel or galvanized and shall have removable screw mounted covers with brass machine screws.
3. Cast metal "FS" or "FD" type boxes shall have threaded hubs. In special cases where standard types are not available, blank boxes may have threaded hubs brazed on, or if necessary suitably thick boxes may be drilled and tapped.

B. Outlet boxes for surface mounted and pendant mounted lighting fixtures shall be 4" octagon boxes, 1-1/2" deep.

C. Outlet boxes for flush mounted lighting fixtures shall be 4" square boxes 1-1/2" deep, with blank cover, installed adjacent to fixture. Connection to fixture shall be with flexible conduit.

D. Outlet boxes for switches, receptacles and wall mounted junction boxes shall be 4" square boxes, 1-1/2" deep with square edge tile type cover. Where only one conduit enters box, 3-1/2" deep single gang switch box may be used.

E. Outlet boxes for switches and receptacles in exposed wiring system shall be cast FS boxes with matching device plate. Surface outlet boxes for dry locations shall be the cast type for locations requiring rigid or IMC raceway types. Switch and receptacle boxes for exposed wiring in equipment rooms may be surface mounted "handy" type boxes. Wall boxes for outdoor or wet locations use shall be the cast type furnished complete with weatherproof covers and rubber or neoprene gaskets. Device plates for exterior installations shall be weatherproof, spring loaded hinged covers. Use FD box for GFI receptacle.

F. Outlet boxes for individual switches, and receptacles flush mounted in exposed concrete block shall be single gang masonry boxes 3-1/2" deep.

G. Outlet boxes for devices mounted in metal door jambs shall be sheet metal partition boxes 1-6/16" wide and 1-5/8" deep.

H. Outlet boxes for support of surface or pendant mounted lighting fixtures shall be provided with fixture stud.

I. Outlet boxes shall be provided with green sheet metal screw for attachment of equipment grounding conductor.

J. Where actual device provided requires larger outlet box than specified herein, provide outlet box suitable for specific device. These outlet boxes shall be of the same type as specified herein for the installation required.

K. Outlet boxes installed in poured concrete or cast in place shall be concrete-tight type. The box depth shall allow 2" minimum of concrete cover.

L. Dimensions of pull boxes and junction boxes shall not be less than those dimensions required by the National Electrical Code for the number, size and position of conductors entering the box. Only a single extension ring shall be permitted on a box to increase the volume.

M. Horizontal pull boxes containing more than one feeder shall be provided with reinforced flange and removable 12 gauge 1-1/2" x 1-1/2" galvanized channel for support of conductors. Wood supports within pull boxes are not acceptable.

N. Provide box covers for all junction and pull boxes.

O. Where installation of floor mounted device requires penetration of a fire rated floor slab, the installation shall be made with a fire rated "poke-through" fitting, UL listed for use with concrete floors with fire rating to match that of floor penetrated. Fitting shall be selected for depth of floor slab. Fire barrier shall also be rated to prevent passage of smoke when heat is not present.

P. Provide floor outlet boxes compatible with devices indicated on drawings.

Q. Floor boxes for installation in concrete floors on grade shall be the nominal 4-inch diameter, round, cast type with flush cover plates. Flush covers and visible box rings shall be brass or bronze with matching finished screws. Covers shall be: Two separately hinged lids for duplex receptacles. One hinged lid for single receptacle, inset within 2-inch plug. One combination plug, 2 x 1/2 inch type and one split bell nozzle (aluminum), 2 x 1/2 inch type for telephone or data terminal

PART 3 - EXECUTION

3.1 INSTALLATION

A. General

1. Conceal all conduits, except in unfinished spaces such as equipment rooms or where indicated on the drawings.
2. Leave all empty conduits with a 200 pound test nylon pull cord.
3. Install as complete raceway runs prior to installation of cables or wires.
4. Flattened, dented, or deformed conduits are not acceptable and shall be removed and replaced.
5. Secure RGS and IMC to sheet metal enclosures with two locknuts and insulated bushing. Secure EMT to sheet metal enclosures with insulated throat connectors.
6. Fasten conduit support device to structure with wood screws on wood, toggle bolts on hollow masonry, anchors as specified on solid masonry or concrete, and machine bolts, clamps, or spring steel clips, on steel. Nails are not acceptable.
7. Protect conduits against dirt, plaster, and foreign debris with conduit plugs. Plugs shall remain in place until all masonry is complete. Protect conduit stub-ups during construction from damage: any damaged conduits shall not be used.
8. Provide seal-off fittings and sealants for all conduits originating from outside building, from below grade, all conduits entering refrigerated spaces, i.e., freezers and coolers, and all conduits entering exterior mounted electrical equipment with insulating putty to prevent entrance of moisture.
9. Install conduit with wiring, including home runs, as indicated on the drawings. Deviations shall be made only where necessary to avoid interferences and when approved by Architect by written authorization.

10. Conduits which penetrate roof membranes shall be installed in accordance with roofing system manufacturer's recommendations and architectural specifications with a sheet metal pitch pocket filled with asphaltic compound, unless otherwise indicated.
11. Use flexible conduit for connection to vibrating equipment and rotating machinery and for connection from junction box to flush mounted lighting fixtures.
12. Separate raceway systems are to be installed for power systems and for control, signal and communications systems. Do not install control, signal or communications cables in the same raceways as branch circuit or feeder cables, unless indicated otherwise.
13. Provide expansion fitting in all conduits where length of run exceeds 200 feet or where conduits pass building expansion joints.
14. Holes and sleeves shall be provided through floors, walls and roofs as necessary for conduit installation, including flashing and waterproofing as required at exterior walls and roofs. Install sleeves or forms for openings in new work. Provide inserts and holes as required, sleeved, bonded, curbed, flashed, and finished, whether in concrete, steel grating, metal panels, roofs, or other building features.
15. Provide nonshrink grout or foam sealant at all sleeves or holes after the installation of conduit and at all unused sleeves. Install fire- and smoke-rated seals at all conduit penetrations or sleeves of fire-rated floors, ceilings, walls, or partitions.
16. Coat all field-cut threads in galvanized conduit with aluminum paint, zinc treatment cold galvanizing compound, or other approved treatment material.

3.2 APPLICATIONS FOR CONDUIT PERMITTED

A. Interior Installations, Concealed in Walls or Above Ceilings, or Exposed
1. Unless excluded below, not permitted in accordance with the National Electrical Code, or otherwise indicated, all conduit shall be Electrical Metallic Tubing.
2. Conduit shall be run parallel or at right angles to existing walls, ceilings, and structural members.
3. Support branch circuit conduits at intervals not exceeding 10 ft. and within three feet of each outlet, junction box, cabinet or fitting. Attach individual branch circuit conduits to structural steel members with spring steel type or beam conduit clamps and to non-metallic structural members with one hole conduit straps. For exposed conduits and where conduits must be suspended below structure, single conduit runs shall be supported from structure by hangar rod and conduit clamp assembly. Multiple conduits shall be supported by trapeze type support suspended from structure. Do not attach conduits to ceiling suspension system channels or suspension wires.
4. Attach feeder conduits larger than 1" trade diameter to or from structure on intervals not exceeding 12 ft. with conduit beam clamps, one hole conduit straps or trapeze type support in accordance with support systems described for branch circuit conduits.
5. Exposed conduits shall be painted as specified under the PAINTING section of the specifications, or as otherwise indicated in the Architectural documents.
6. Do not install conduits through structural members.
7. Install conduit sleeves in slabs where conduits 2.0" and larger pass through. Sleeves shall extend 1" minimum above finished slab.
8. Install all conduits or sleeves penetrating rated fire walls or fire floors to maintain fire rating of wall or floor.
9. Conduits attached to building construction on opposite sides of a building expansion joint shall be provided with an expansion and deflection coupling. In lieu of an expansion coupling, conduits 2-1/2" and smaller may be provided with junction boxes on both sides of the expansion joint connected by 15" of slack flexible conduit with bonding jumper.
10. No conduit installation requiring cutting of cross-webs of concrete masonry units is permitted. Conduit shall be threaded through cells or concrete masonry units lowered around conduit. Neither horizontal joint reinforcement nor bond beam reinforcement shall be cut for conduit installation.
11. Conduit types shall not be mixed indiscriminately with other types in the same run, unless specified herein or required by the NEC.

12. Conduits which penetrate the building exterior walls or roof shall be RGS or IMC.

B. Installations Within or Below Concrete Floor Slabs

1. Conduits installed within concrete floor slabs which are in direct contact with grade shall be RGS or IMC. Conduits installed within concrete floor slabs which are above grade shall be RGS, IMC, or schedule 40 Heavy Wall PVC. Where transition is made from raceway in slab to any type of raceway out of slab, make transition with RGS elbow. For corrosion protection, where elbow penetrates surface, wrap with vinyl all-weather electrical tape or coat with bituminous asphaltic compound, for 6" above and below concrete surface.
2. Service entrance conduits shall be either RGS or, where installed underground, schedule 40 heavy wall PVC encased in a concrete ductbank. Service entrance conduits shall be installed "outside the building" as defined by the National Electrical Code. Other conduit in direct contact with earth shall be either schedule 40 heavy wall PVC or RGS.
3. Conduit shall be run following the most direct route between points.
4. Raceways routed in concrete floor slabs shall be located with minimum separation and cover for raceways and fittings as follows:
    a. Minimum top cover of 1-inch for conduits 1-1/4-inch and smaller.
    b. Minimum top cover of 1-1/2 inches for conduits 1-1/2-inch and larger.
    c. Conduits routed parallel in finish floor slab concrete shall be spaced a minimum distance of three times their trade diameters apart, with a maximum of three conduits in any two foot wide section.
    d. Conduits located on top of structural floor slabs shall be spaced such that a minimum bottom cover of one inch shall be maintained for conduits and fittings.
5. Conduit shall not be installed in concrete which is less than 3" thick or where the outside diameter is larger than 1/3 of the slab thickness.
6. Conduits installed in concrete slabs shall be buried in the concrete slab. Wire low conduits to upper side of the bottom reinforcing steel, and upper conduits to the lower side of the top reinforcing steel. Separate parallel runs of conduits within slab by at least 1".
7. Conduits shall not be installed within shear walls unless specifically indicated on the drawings. Conduits shall not be run directly below and parallel with load bearing walls.
8. Protect each metallic conduit installed in concrete slab or conduits 1.5" and smaller passing through a concrete slab against corrosion where conduit enters and leaves concrete by wrapping conduit with vinyl all-weather electrical tape.
9. Protect all conduits entering and leaving concrete floor slabs from physical damage during construction.
10. Install all conduits penetrating rated fire floors to maintain the fire rating of the floor penetrated.
11. The maximum projection of conduit stub-up and bushing above slab shall be 3". Install flush with finished slab where indicated.

C. Miscellaneous Applications

    a. Use flexible conduit for connections to flush- or chain-mounted lighting fixtures, motors, plumbing or HVAC equipment.
    b. Flexible conduit used for connection of motors, plumbing and HVAC equipment shall not exceed 18" in length for trade diameter sizes 3" or less, 21" in length for 3 1/2" trade diameter size, and 24" in length for 4" trade diameter size.
    c. Flexible conduit from outlet box to lighting fixtures shall not exceed 6 feet in length.
    d. Maintain ground continuity through flexible conduit with green equipment grounding conductor; do not use flexible conduit for ground continuity.
    e. Liquid tight conduit shall be used to connect equipment in mechanical equipment rooms, exterior installations, and where equipment is subject to dripping oil, moisture, or corrosive atmospheres.
2. Rigid aluminum conduit may be used where indicated on the drawings, or for all trade sizes 3.0" and larger for conduits not installed in concrete slabs, not installed in direct contact

with earth, not installed in hazardous locations as defined by Article 500 of the National Electrical Code, and not installed in areas exposed to excessive moisture.

3. Where hazardous locations, as classified by the National Electrical Code, exist, all conduits, seal-off fittings, and other accessories and the installation of these materials shall comply with Article 500 of the National Electrical Code.
4. All raceways in direct contact with water in pools or fountains shall be non-corrosive metal as required by Article 680 of the NEC.
5. All conduits for interior wiring systems whose voltage is above 600 volts shall be RGS or IMC.
6. All conduits entering refrigerated spaces shall be RGS.

3.3 BOX INSTALLATION

A. All boxes shall be completely accessible as required by the NEC. Provide access panels in any non-accessible spaces if required.

B. Provide an outlet box for each lighting fixture and for each device. Boxes shall not be smaller than indicated in this section of the specifications and shall be larger if required by Article 370 of the National Electrical Code for the number and size of conductors installed. Where lighting fixtures are installed in continuous rows, only one outlet box is required.

C. Outlet boxes for flush mounted lighting fixtures shall be accessible. Where fixture installation is in an inaccessible ceiling, outlet box shall be accessible when fixture is removed.

D. Set outlet boxes for flush mounted devices to within 1/8" of finished wall. Spacers or shims between box and device are not acceptable.

E. Where low voltage device is to be installed in common outlet boxes with line voltage device, provide metal barrier within outlet box to establish two separate compartments.

F. Where ganged installations of switches controlling lighting circuits of opposite phase are indicated, separate switches with permanently installed nonmetallic barrier. Where space available for horizontal ganged installation is not adequate, install switches vertically to maintain required clearances between energized terminals.

G. Where an emergency powered device is to be installed in common outlet boxes with an utility powered device, provide metal barrier within outlet box to establish two separate compartments.

H. Support every box from structure:
1. Secure to wood with wood screws.
2. Secure to hollow masonry with toggle bolts.
3. Secure to metal with sheet metal screws, machine bolts, or clamps.
4. Anchors for solid masonry and concrete shall be self drilling expansion shields, insert expansion shields, or lead shields with machine bolts. Power actuated pin studs may be used in concrete.
5. Secure outlet boxes to metal studs with spring steel clamp which wraps around entire face of stud and digs into both sides of stud. Clamp shall be screwed into stud.
6. Where box is suspended below structure, support from structure with threaded steel rod. Secure rod directly to outlet boxes with double nuts. For pull boxes larger than 18" x 18" x 6", construct 1-1/2" x 1-1/2" x 14 gauge metal channel frame. Connect frame to box by bolting and secure frame to threaded rod at each corner.
7. Hub type cast boxes need not be directly attached to structure if rigid conduit is used and supported in conformance with the National Electrical Code.

I. Support outlet boxes for support of surface mounted lighting fixtures by light weight channel spanning between and attached to main ceiling support member. Attach channel to ceiling support members.

J. Do not use outlet boxes for support of fixtures not recommended by fixture manufacturer to be supported by outlet box; boxes shall be used only as junction boxes.

K. Remove only knockouts required and plug all unused openings. Use threaded plugs for cast boxes and snap-in metal plugs for sheet metal boxes.

L. Outlet boxes in the same wall shall not be mounted back-to-back. Offset 6" minimum. Offset 24" minimum at fire rated partitions.

M. Install pull boxes only in unfinished spaces or concealed above ceilings, except when indicated on the drawings.

N. Install pull boxes for any of the following conditions:
1. Where indicated on the drawings.
2. Where conduit run exceeds 200 ft. from box to box or box to terminal.
3. Where conduit contains more than 4-90 degree bends or the equivalent offsets.
4. To facilitate conductor installation or to insure that the manufacturer's maximum pulling tension is not exceeded.

O. Do not splice conductors in pull boxes. Splices are not permitted in pull boxes except where shown on the drawings. Where splices are permitted, make splices with splicing sleeves attached to conductors with hydraulic crimping tool. Split bolt connectors are not acceptable for splices within pull boxes.

P. Where a pull box for multiple circuits is required, separate circuits as follows:
1. Circuit conductors and feeders shall be individually laced with nylon tie straps. Boxes installed in masonry walls shall have covers of required depth to avoid cutting of masonry. Boxes for exterior work shall be FS or FD Series, with cadmium plated covers. the type with enlarged tab to permit identification of each circuit and feeder within pull box. Identify each with respect to load served.
2. Circuits shall be separated by full height and length sheet metal or polyester resin barrier secured to box by angle brackets.

Q. Box covers shall be in place and secured to box.

R. Box identification: Using an indelible wide tip black marker, indicate on the cover of each junction and pull box the designation of the circuits contained therein, e.g., HDA-1,3,5. Where painting of boxes is specified under this Division or elsewhere in these specifications, marking shall be done after final finish coat is applied.

S. After completion, clean all box interiors and exteriors of dirt and construction debris.

T. Where exposed wiring in rigid steel conduit is indicated, provide cast outlet box with threaded hubs.

U. Where conduits enter sheet-steel outlet boxes, cabinets or pull boxes, fasten with two locknuts and insulating bushings or single locknut and combination locknut/bushing.

A. Unless otherwise indicated, boxes not containing wiring devices or lighting fixtures shall be provided with suitable blank cover plates. Blank cover plates shall match any nearby switch or receptacle plates, or other type necessary to achieve matching appearance

3.4 ADJUSTMENT, CLEANING AND PROTECTION

A. Upon completion, clean all installed materials of excess paint, dirt, and construction debris. All conduit systems shall be cleaned of water and debris prior to the installation of any conductors.

END OF SECTION 26 05 33

SECTION 26 08 00

ELECTRICAL ACCEPTANCE TESTING

PART 1 - GENERAL

1.1 DESCRIPTION

A. The work required under this section of the specifications consist of the start-up testing and inspection of the electrical equipment designated within. All labor and testing equipment which is required shall be provided under this section of the specifications.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.3 GENERAL

A. The Contractor shall perform the tests as outlined below to insure system acceptance or shall engage the services of an approved testing organization to provide start-up testing and inspection of the electrical equipment as specified in this section. The testing organization may be an independent division of the manufacturer of the assembled products being tested. If an outside testing organization is approved, a representative of the manufacturer shall be under contract by the testing company. He shall be present during all testing to insure that the testing is performed properly and that any deficiencies discovered are promptly corrected.

B. The testing organization shall provide the equipment and technical personnel to perform such tests and inspections. The contractor shall, at his expense, furnish any personnel necessary to assist in the testing and inspection.

C. When the tests and inspections have been completed, a label shall be attached to all devices tested. The label shall provide the name of the testing company, the date the tests were completed, and the initials of the engineer who performed the tests.

D. The tests shall insure that the equipment is operational and functioning within industry standards and manufacturer's tolerances. Forward all test reports to the Architect at least two weeks prior to the project final inspection for review. Reports shall be bound as required by Division 1 of this specification.

1.4 QUALITY ASSURANCE

A. Industry Referenced Standards. The testing and inspection shall comply with all applicable sections of the following codes and standards:
1. American National Standards Institute - ANSI
2. American Society for Testing and Materials - ASTM
3. Association of Edison Illuminating Companies - AEIC
4. Institute of Electrical and Electronics Engineers - IEEE
5. Insulated Power Cable Engineers Association - IPCEA
6. International Electrical Testing Association - NETA Acceptance Testing Specifications
7. National Electrical Code - NEC
8. National Electrical Manufacturers Association - NEMA
9. National Fire Protection Association - NFPA
10. State and Local Codes and Ordinances
11. National Electrical Contractors' Association (NECA):

a. Standards of Installation

B. The inspection and testing shall comply with the project plans and specifications as well as with the manufacturer's drawings, instruction manuals, and other applicable data for the apparatus tested.

1.5 SUBMITTALS

A. Refer to BASIC ELECTRICAL REQUIREMENTS for submittal requirements.

1.6 DIVISION OF RESPONSIBILITY

A. The Contractor shall:
1. Perform routine insulation-resistance, continuity, and rotation tests for all distribution and utilization equipment prior to and in addition to tests performed by the testing firm specified herein.
2. Supply a suitable and stable source of electrical power to each test site.
3. Notify the testing firm when equipment becomes available for acceptance tests. Work shall be coordinated to expedite project scheduling.

B. The testing firm shall:
1. Notify the Architect prior to commencement of any testing.
2. Report to the Architect any system, material or workmanship which is found defective on the basis of acceptance tests.
3. Maintain a written record of all tests and, upon completion of project, shall assemble and certify a final test report.

1.7 SAFETY AND PRECAUTIONS

A. Safety practices shall comply with applicable state and local safety orders as well as with the Occupational Safety and Health Act of 1970 (OSHA). Compliance with the National Fire Protection Association standard NFPA 70E and the Accident Prevention Manual for Industrial Operations of the National Safety Council shall be observed.

B. Tests shall only be performed on apparatus which is de-energized. The testing company's lead test engineer for the project shall be a designated safety representative and shall supervise testing observations and safety requirements. Work shall not proceed until he has determined that it is safe to do so.

C. Power circuits shall have conductors shorted to ground by a hotline grounded device approved for the purpose. Warning signs and protective barriers shall be provided as necessary to conduct the tests safely.

1.8 REPORTS

A. The test report(s) shall include the following sections:
1. Scope of testing
2. Electrical equipment tested
3. Description of test procedures
4. Test results
5. Conclusions and recommendations
6. Appendix, including test forms

B. Each piece of equipment shall be recorded on a data sheet listing the condition of the equipment as found and as left. Included shall be recommendations for any necessary repair and/or replacement

parts. The data sheets shall indicate the name of the engineer who tested the equipment and the date of the test completion.

C. Record copies of the completed test report shall be submitted no more than 14 days after completion of the testing and inspection.

1.9 TEST EQUIPMENT

A. All test equipment shall be in good mechanical and electrical condition. All field instruments shall have been calibrated within six months of the testing date, and dated calibration labels shall be visible on the testing equipment. Submit calibration certification in the final report.

PART 2 - PRODUCTS

2.1 GENERAL MATERIALS REQUIREMENTS

A. All materials are specified under other sections of this specification. All testing equipment required shall be provided under this section of the specifications.

PART 3 - EXECUTION

3.1 EQUIPMENT TO BE TESTED

A. Equipment shall be tested in accordance with the following scopes of work.
1. Molded Case Circuit Breakers
2. Lighting Control System
3. Grounding System
4. Cables, 600 Volts

3.2 MOLDED CASE CIRCUIT BREAKERS

A. Visual and Mechanical Inspection
1. Inspect cover and case, and check for broken or loose terminals.
2. Operate breaker to check operation.

B. Electrical Tests (400 ampere frame and larger)
1. Insulation Resistance Test: Megger main poles of breaker pole-to-pole, from each pole to ground, and across the open contacts of each pole.
2. Contact Resistance Test: Ductor across main pole contacts with breaker closed and latched to check for good, low resistance contact.
3. Test overcurrent trip device and calibrate [to settings provided by the engineer.] Where primary injection testing is specified, test each pole of the breaker individually. Data shall be compared with manufacturer's published data.
   a. All trip units shall be tested by primary injection.
   b. Static overcurrent trip devices shall be tested per manufacturer's instructions.
   c. Test for minimum pick-up current.
   d. Apply 300% of pick-up current and measure time necessary to trip breaker (long time delay).
   e. Where short time delay characteristics are provided, test short time pick-up and delay.
   f. Test instantaneous trip by passing current sufficiently high to trip breaker instantaneously.
   g. Where ground fault protection is provided, test ground fault pick-up and delay.

h. Check reset characteristics of trip unit.

4. Electrically test any auxiliary devices such as shunt trips, undervoltage trips, alarm switches, and auxiliary switches.

3.3 LIGHTING CONTROL SYSTEM

A. Visual and Mechanical Inspection

1. Inspect each device for physical damage.
2. Check for proper labeling of conductors
3. Inspect all system lamps and LED's for proper operation. Replace all non-operational equipment.
4. Check all cabinet doors, latches, and hinges for proper operation. Adjust, lubricate, and/or repair as required.

B. Electrical Tests

1. Verify the absence of unwanted voltages between circuit conductors and ground that would constitute a hazard or prevent proper system operation.
2. Meggar test all conductors (other than those intentionally grounded) for isolation from ground.
3. Test all conductors (other than those intentionally connected together) for conductor-to-conductor isolation using as insulation testing device.
4. The control unit shall be tested to verify it is in the proper operating condition as detailed in the manufacturer's manual.
5. Each control circuit shall be tested to confirm proper operation of the circuit.

3.4 GROUNDING SYSTEM

A. Visual and Mechanical Inspection

1. Inspect wiring system outlet and junction boxes for proper grounding. Green grounding conductor shall be connected to outlet and junction boxes. Inspect a minimum of 5% of project boxes.
2. Verify connections of grounds for the secondary of separately derived grounding systems, i.e. at dry type transformers. Note type of connection, i.e. mechanical or exothermic.
3. Verify proper connection to all components of building service entrance grounding system. Note all system components which are interconnected and type of connection either mechanical or exothermic. Note depth of driven ground rods.

B. Equipment Grounds

1. Utilize two-point method of IEEE Std. 81. Measure between equipment ground being tested and known low-impedance grounding electrode or system.

C. Test Values

1. The main ground electrode system impedance-to-ground should be no greater than five (5) ohms for commercial or industrial systems and one (1) ohm of less for generating stations, transmission stations, and large industrial systems. Equipment grounds, depending on size and length of grounding conductor, should be only fractionally higher than system ground.

END OF SECTION 26 08 00

SECTION 26 24 16

PANELBOARDS

PART 1 - GENERAL

1.1 DESCRIPTION

A. The work required under this section of the specifications consists of the furnishing, installation, and connection of lighting and appliance panelboards and distribution type panelboards and accessories.

B. Panelboards designated as HDA, DA, etc., or indicated on the drawings are distribution type panelboards. Those designated as HA, A, etc., are lighting and appliance type panelboards.

C. Definitions: The term panelboard, as used in this specification or on the drawings, shall mean the complete assembly including the enclosure, bus work, trim hardware and circuit breaker or fused devices. The words panel and panelboard are used synonymously in these documents.

1.2 QUALITY ASSURANCE

A. Industry Referenced Standards. The following specifications and standards are incorporated into and become a part of this Specification by reference.
1. Underwriters' Laboratories, Inc. (UL) Publications:
   a. No. 50 Cabinets and Boxes, Electrical
   b. No. 67 Panelboards
   c. No. 489 Molded Case Circuit Breakers and Circuit Breaker Enclosure
2. National Electrical Manufacturer's Association (NEMA) Publications:
   a. No. PB-1 Panelboards
   b. No. AB-3 Molded Case Circuit Breakers
3. National Fire Protection Association (NFPA) Publications:
   a. No. 70 National Electric Code (NEC)
4. National Electrical Contractors' Association (NECA):
   a. Standard of Installation

B. Acceptable Manufacturers. Products by the following manufacturers which conform to this specification are acceptable.
1. Eaton
2. General Electric
3. Siemens
4. Square D

1.3 SUBMITTALS

A. Refer to BASIC ELECTRICAL REQUIREMENTS for submittal requirements.

B. Manufacturers Product Data: Submit material specifications and installation data for circuit breakers, Panelboards, and (where indicated) fused switch devices

C. Shop Drawings: Submit shop drawings to indicate information not fully described by the product data to indicate compliance with the contract drawings.
1. Include electrical characteristics and ratings for each panelboard with dimensions, mounting, bus material, voltage, ampere rating, mains, poles and wire connection, and any accessories. Indicate method of ground bus attachment to enclosure.
2. Include front elevation bussing diagram indicating each bussing circuit breaker position.

3. Provide a schedule indicating circuit breaker type, trip and size, poles, frame type, and interrupting capacity.
4. Nameplate identification designation schedule.

D. Record Drawings. Include in each set:
1. A complete set of panelboard manufacturers product data and shop drawings indicating all post bid revisions and field changes.
2. A copy of each panelboard directory incorporating all post bid revisions and field changes.

PART 2 - PRODUCTS

2.1 GENERAL MATERIALS REQUIREMENTS

A. Provide all materials under this section of the specifications.

B. All panels and circuit breakers shall be UL listed and bear a UL label. Where panel serves as service entrance equipment, panel shall bear a UL label indicating listing as service equipment.

C. Panels shall be of the dead front safety type.

D. Provide panels complete with factory assembled circuit breakers connected to the bus bars. Unless shown otherwise on the drawings, position circuit breakers in panelboards with single pole breakers, equally divided, occupying top positions with two and three pole breakers occupying lower positions.in the positions shown on the panel schedules or bus diagrams as indicated on the drawings.

E. Number all panelboard circuits in the following sequence: Circuits No. 1 and 2, Phase A; Circuits No. 3 and 4, Phase B; Circuits No. 5 and 6, Phase C. Connect two pole breakers to phase indicated on the drawings.

2.2 MATERIALS DESCRIPTION

A. Panelboard Bussing and Interiors
1. Main lugs and main breakers shall be UL approved for copper conductors and shall be of a size range for the conductors indicated on the drawings. Each panel shall contain an equipment grounding bus. Each lighting and appliance panelboard shall contain a full size insulated neutral bus. Distribution type panelboard neutral bus shall be insulated and full size, unless otherwise indicated on the drawings.
2. The neutral and ground busses shall have a sufficient number of lugs to singularly terminate each individual conductor requiring a connection.
3. The ground bus shall be factory brazed, riveted or installed on studs welded or bolted to the panel enclosure or panel frame. The ground bus shall not be attached to the panel interior.
4. Where designated on panel schedule as "space", include all necessary bussing, device support and connections for installation of future devices compatible with panel. Provide blank cover for each space.
5. Where indicated, provide sub-feed lugs adjacent to the mains or feed-through lugs opposite the mains and increase box heights to provide additional cable bending and termination space. Lugs shall be the same size and capacity as mains.
6. Where indicated, insulated ground bus for isolation receptacle grounding shall be solid copper, mounted in panel enclosure on insulated stand off mounts.

B. Panelboard Enclosures

1. Provide panelboard gutters and bending space at terminals to conform to the National Electrical Code. Wiring gutters shall be oversized if necessary to provide sufficient space for taps, etc., as necessary.
2. Cabinets shall have full sized single doors. Doors more than 48 inches high shall have three point latching mechanisms.
3. Door locks shall be provided and shall be chromium plated combination cylinder lock and catch. Key slots shall be in the vertical position when locked. Locks shall be keyed alike and furnished with two keys per lock.
4. Trims, clamps and hinges on flush mounted 20 or 22 inch wide panelboards shall be completely concealed when the door is closed. Trims shall have adjustable trim clamps and shall not be removable with the door locked.
5. Panelboard width shall not be less than 20", nor more than 22" unless specific width is indicated on the drawings. Panelboard depth shall not exceed 5-3/4". Distribution panelboard width shall not be less than 31" and the depth shall not exceed 14".
6. The directory card shall be filled in using a typewriter with circuit wording adequately identifying circuits/loads as indicated. Spares and spaces shall be labeled as such using pencil in a neat and legible printed lettering.
7. For flush mounted panels, provide concealed captive clamping devices, concealed hinges and lock for all flush mounted panels. Key all panels throughout project alike.
8. All surface mounted panels shall be provided with door-in-door hinged cover trims. Trims shall be secured by piano hinges to enclosure and secured closed by two trim clamps.

C. Panelboard Circuit Breakers
1. Interrupting rating of all circuit breakers in panelboards operating on 208Y/120 volt system shall have UL rating of not less than 10,000 RMS symmetrical amps at system voltage. Panelboards for use on 480Y/277 volt system shall contain circuit breakers with UL interrupting rating of not less than 18,000 RMS symmetrical amps at system voltage. Provide circuit breakers with higher interrupting capacity when indicated on the drawings.
2. Series Ratings: Lighting and appliance panels and associated circuit breakers tested and listed in accordance with UL 67 and bearing an integrated short circuit rating shall be acceptable where system designs call for short circuit ratings of 65,000 AIC at system voltages. Note that series-rating may be with upstream fuses or circuit breakers. Provide evidence of series rating with shop drawing submittals. Provide permanently mounted plaque on panel labeled as follows: “CAUTION: Replace circuit breakers with devices rated 65kAIC only.”
3. Circuit breakers shall be provided with trip rating, poles and minimum interrupting rating as indicated on the drawings or specified herein.
4. Multi-pole breakers shall be common trip and common reset; tie handle connection between single pole breakers is not acceptable.
5. Branch circuit breakers in lighting and appliance panels shall be quick-make, quick-break, thermal magnetic type bolted to the bus. Circuit breakers in distribution type panelboards shall be bolted to the bus.
6. Molded case circuit breakers shall have automatic, trip free, non-adjustable, inverse time, and instantaneous magnetic trips.
7. Circuit breakers serving multi-motor equipment such as roof top units, compressor racks, etc.; or where required by equipment manufacturer, provide HACR type breaker.
8. Provide the following special devices and accessories when indicated on the drawings, specified herein, or required by the NEC.
    a. Provide handle lock-off device to prevent manually turning off device without removal. Install on all circuit breakers serving exit lighting, egress lighting, fire alarm system, security system, communications system, refrigeration equipment, and indicated on the panel schedules.

D. Separately enclosed molded case circuit breakers: Where separately enclosed molded case circuit breakers are shown on the drawings, provide circuit breakers in accordance with the applicable requirements of those specified for panelboards.

E. Where existing panelboards are incorporated into the project, provide circuit breakers which comply with the specifications listed herein, and which are compatible in mounting and electrical characteristics with the existing circuit breakers in the associated panels. New circuit breaker AIC ratings shall match or exceed the rating of the highest-rated existing circuit breaker.

F. Fusible Switch Devices
1. Protective devices shall be quick-make, quick-break fusible switches. Fusible switches rated 30 to 600 amperes shall have fuse clips suitable for Class R fuses and shall be UL listed at 100,000 AIC. Fusible switches 800 amperes through 1200 amperes shall be furnished with Class L fuse clips and UL labeled for 200,000 AIC. Switches shall incorporate safety cover interlocks to prevent opening of the cover with a switch in the "on" position or prevent placing the switch in the "on" position with a cover open-provide defeater for authorized personnel. Handles shall have provisions for padlocking and shall clearly indicate the "on" or "off" position. Front cover doors shall be padlockable in the closed position.
2. Where shown on the drawings, provide a UL listed shunt trip attachment 120 volt with 480 volt to 120 volt fused primary and secondary control power transformer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Panelboards shall be mounted with the top of cabinet or enclosure 6'-6" above the finished floor, but with bottom of cabinet not closer than 6 inches to the floor.

B. Lace and group conductors installed in panels with nylon tie straps. Only one conductor shall be installed under terminal of individual circuit breakers. Form and train conductors in panel enclosure neatly parallel and at right angles to sides of box. Uninsulated conductor shall not extend beyond one-eights inch from terminal lug.

C. Do not splice conductors in panels. Where required, install junction box adjacent to panel and splice or tap conductors in box. Size box in accordance with conductor conduit limitation requirements of the National Electrical Code as defined in the Wires and Cables section of the specifications.

D. Mounting and Support
1. Mounting: Enclosures shall be mounted where indicated on the drawings or specified herein. Support from the structure with fastening device specified.
   a. Enclosure shall be secured to structure by a minimum of four (4) fastening devices. A 1.5" minimum diameter round washer shall be used between head of screw or bolt and enclosure.
   b. Attach enclosure directly to masonry, concrete, or wood surfaces.
   c. Mount enclosure on metal channel (strut), which is connected to structure with fastening device specified, for installations on steel structure or sheet rock walls.

E. Conductors not terminating in panelboard shall not extend through or enter panel enclosure.

F. Typewritten circuit directory mounted on interior of panel door shall reflect any field changes or additions.

G. The trim covers of all flushed mounted panelboards shall be field painted. Refer to the Painting section of the specifications. Do not paint locks and exposed trim clamps.

H. Install six 3/4" empty conduits from each flush mounted panelboard into an accessible ceiling cavity.

I. Install push-in knock-out closure plugs in any unused knock-out openings.

J. Identification: Panelboards and individually mounted circuit breakers shall be identified. Refer to the BASIC ELECTRICAL REQUIREMENTS section of these specifications for identification requirements.

K. Where isolated ground receptacles are indicated, provide an isolated ground bar in the appropriate panel. Only one wire shall be terminated per a terminal lug.

L. Where new circuit breakers are installed in existing panels, confirm that the new breaker is securely mounted to the existing panel interior before energizing.

3.2 CLEANING AND ADJUSTMENT

A. After completion, clean the interior and exterior of dirt, paint and construction debris.

B. Touch up paint all scratched or marred surfaces with factory furnished touch up paint of the same color as the factory applied paint.

C. Adjust and align panelboard interior and trim in accordance with manufacturers recommendations, and to eliminate gaps between the two.

3.3 FIELD QUALITY CONTROL

A. Contractor shall verify in the field that all factory-made connections and terminations are torqued to manufacturer's recommended tolerances.

B. Coordination: Coordinate installation with architectural and structural features, equipment installed under other sections of the specifications and electrical equipment to insure panel access and insure that clearance minimums are provided.

C. Refer to the ELECTRICAL ACCEPTANCE TESTING section of this specification.

END OF SECTION 26 24 16

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.1 DESCRIPTION

A. The work required under this section of the specifications consists of the installation of wiring devices, i.e. switches, receptacles, and device plates. All materials shall be provided under this section of the specifications.

B. The catalog numbers listed herein for switches and receptacles are not intended to represent finish color of device. Regardless of catalog numbers, the switches and receptacles provided on this project shall have finish color as selected by the Owner's Representative, unless otherwise indicated. All special purpose receptacles shall be provided in black finish.

1.2 QUALITY ASSURANCE

A. The following standards are incorporated into and become a part of this specification by reference:
1. NEMA WD-1 General Purpose Wiring Devices
2. NEMA WD-5 Specific Purpose Wiring Devices

1.3 ACCEPTABLE MANUFACTURERS

A. The manufacturers' catalog numbers listed herein for switches and receptacles are not intended to represent the only available source of the device, they are intended to establish a level of quality. Devices as manufactured by the following which comply with this specification are acceptable, unless otherwise indicated:
1. NEMA configuration:
a. Arrow Hart
b. Eagle
c. General Electric
d. Hubbell
e. Pass & Seymour
2. Pin-and-sleeve, hazardous-location rated, or other configuration:
a. Crouse-Hinds
b. Appleton
c. Killark
d. Russelstoll

PART 2 - PRODUCTS

2.1 SWITCHES

A. Select switches from the following:
1. Single pole, 20 amp 120/277 volt switch: Hubbell 1221/3/4 series
2. Incandescent Dimmer, 120V: Lutron N-series, selected to exceed the connected load
3. Weatherproof, 20 amp 120/277 volt switch: Hubbell 1281/3 series
4. Single pole, 20 amp 120/277 volt key switch: Arrow Hart 1191/3 series
5. Single pole, 20 amp 120 volt switch, pilot light in handle: Arrow Hart 2999 series.
6. Switch in narrow door jamb: Arrow Hart QST series

2.2 RECEPTACLES

A. Select general purpose receptacles from one of the following:
1. 15 amp, 125 volt grounded duplex receptacle (NEMA 5-15R): Hubbell 5262
2. 20 amp, 125 volt grounded duplex receptacle (NEMA 5-20R): Hubbell 5362
3. Clock receptacle (NEMA 5-15R): Arrow Hart 5708
4. Ground Fault Interrupter (GFI) 20 amp, 125 volt duplex receptacle: Hubbell GF-5362. GFCI receptacles shall be flush mounting, straight blade, rated 125 volts, and 15 amperes, unless otherwise indicated. Receptacles shall have a self-grounding mounting strap feature. Wiring terminal screws shall be brass metal. Ground Fault circuit Interrupted (GFCI) receptacles shall be U.L. listed as providing protection for personnel against line-to-ground shock hazard. The GFCI device shall continuously monitor current in the phase and neutral conductors and shall interrupt the circuit for a current differential of more than 5mA to the outlet(s). The device shall be solid state with test button and indicator, a reset button, labeled and with printed instructions. The GFCI receptacle shall be the end-of-line type

2.3 DEVICE PLATES

A. Device plates shall be one piece single or multi-gang type selected to match the device or combination of devices. Device plates for flush mounted devices shall be Type 302 stainless steel unless indicated otherwise. Provide tamper proof screws where indicated.
1. Device plates for use with flush devices shall be jumbo type. Device plates for surface mounted devices shall be for use with the type of outlet box in which the device is mounted. All devices installed in areas exposed to the weather and where indicated on the drawings shall be provided with a weatherproof device plate.
2. Areas identified as wet locations or defined as wet locations by NEC 100 or as designated as weatherproof (“WP”) on the drawings shall have a weatherproof enclosure listed as weatherproof when in use.
3. Where engraved device plates are indicated on the drawings or specified, lettering shall be 1/8" high and shall be black unless other contrasting color is specified.

2.4 SPECIAL PURPOSE RECEPTACLES

A. Special purpose receptacles shall be of the type indicated by either NEMA designation or other designation shown on the drawings. Furnish one matching plug for the Owner’s use with every special purpose receptacle indicated.

2.5 ATTACHMENT PLUGS AND CONNECTORS

A. Attachment plugs shall be U.L. listed and shall have the following basic features:
1. Dead-front construction, back-wired.
2. Heavy duty, solid brass blades with standard end of blade located detent hole.
3. Solid brass terminal screws.
4. Cord grip.
5. Grounding blade (unless otherwise specified).

2.6 FLOOR MOUNTED RECEPTACLES AND COMMUNICATIONS OUTLETS

A. Floor mounted outlets shall include the devices indicated on the drawings as shall be as manufactured by FSI, Inc., Hubbell, Steel City, or Walker/Wiremold. Fittings shall have a base-plate that allows a 3/4-inch adjustment to either side of center.

B. Cover plates shall be provided for each device furnished or installed. Cover plates and devices shall be of matching finish, unless otherwise specified or indicated.

C. Devices shall be mounted recessed for flush installations, unless otherwise indicated.

D. Refer to CONDUITS AND BOXES specification section.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

A. Unless otherwise indicated or directed by the Owner's Representative, wiring devices shall be installed in a vertical orientation with center-of-box distances from finished floors as indicated in the drawings and between 18 and 48 inches, to meet handicapped access requirements. Device outlets in concrete block, brick or tile shall be above or below a joint such that the center-of -box is between 18 and 48 inches.

B. Review Architectural Drawings for any device requiring specific location or mounting height. Install devices above countertops with major axis horizontal above the backsplash. Receptacles above counter tops shall be installed with top-of-box at 12 inches above the counter and with bottom of box above any splash plate. Other special mounting height devices shall be installed as indicated or required. Devices indicated located in the same approximate position on one section of wall, floor, column, etc. shall be grouped to create a functional and pleasing appearance. Similar outlet groups throughout the job shall be similarly grouped. Unless indicated otherwise, groups shall be developed as follows where applicable:
1. Devices at different levels shall be aligned vertically.
2. Devices at the same level shall, where possible, be grouped using sectional gang boxes.
3. Devices or device groups occurring in architectural features, i.e., wall sections, etc. shall be accurately centered in the feature(s), unless indicated or functionally required otherwise.
4. Wall switches shall be located on the strike side of a door, six (6) inches from the door opening, unless otherwise functionally required or indicated.

C. Device Plates:
1. Cover plates for flush, dry, ordinary locations shall be standard configuration, one piece standard size plates with matching screws, unless otherwise indicated.
2. Wall cover plate styles, material and finishes shall be as scheduled by the plans.
3. Cover plates with labeling shall be the engraved type, unless otherwise indicated.
4. Unless indicated otherwise, wall cover plates shall be the device strap mounting type.
5. Cover plate mounting screws shall be tightened to a snug tension and aligned with any screw slot in a vertical position.

D. Furnish and install suitable attachment plugs for installed equipment not provided with appropriate plug(s). Where attachment plugs are furnished but are for any reason not suitable, remove the plugs and/or cord and replace same with suitable devices and cord. Attachment plugs shall be the straight body, dead-front grounding type, unless otherwise indicated or required.

E. Install a green insulated bonding jumper between receptacles and grounded outlet boxes, and provide other grounding per the requirements of the GROUNDING section. Where provided, isolated ground receptacles shall be grounded only through their isolated grounding means, with grounding connection (bond) only at the separately derived electrical source. Raceways with wiring for such devices shall be metal and effectively grounded to the equipment and enclosure grounding system for the building.

END OF SECTION 26 27 26

SECTION 26 50 00

LIGHTING FIXTURES

PART 1 - GENERAL

1.1 DESCRIPTION

A. The work required under this section of the specifications consists of the provision of all lighting fixtures for the project, including mounting hardware, poles, and lamps.

B. Provide complete lighting systems, including luminaires, controls, indicators, power and control wiring, ceiling reinforcements, mounting supports, hardware and other items as specified, noted by the plans, required for operation, or otherwise indicated.

1.2 QUALITY ASSURANCE

A. Industry Referenced Standards. The following specifications and standards are incorporated into and become a part of this Specification by reference.
1. Underwriters' Laboratories, Inc. (UL) Publications pertaining to lighting fixtures.
2. National Electrical Manufacturers' Association (NEMA) Standard Publications LE 1 and LE 2 pertaining to lighting equipment.
3. National Fire Protection Association (NFPA) Publications NFPA-70 and NFPA-101 pertaining to lighting fixtures.
4. American National Standards Institute (ANSI) / Illuminating Engineering Society (IES) Standard ANSI 132.1 pertaining to interior lighting fixtures.
5. National Electrical Contractors' Association (NECA) Standards of Installation.
6. American Society of Testing Materials (ASTM).
7. American Association of State Highway Transportation Officers (AASHTO).

B. Acceptable Manufacturers.
1. Lighting Fixtures: The drawings indicate lighting fixture selections by referencing one or more fixture manufacturers and product catalog numbers for each type. The fixtures were used as the basis of design. Products of the following manufacturers may be submitted for evaluation by the Architect/Engineer in accordance with any applicable Division 0 or Division 1 requirements. Fixture submittals must provide adequate information to show equivalence, including but not limited to, photograph or isometric drawing of fixture, photometric data, dimensional data, optional features listing, and information on construction, type of finish, etc.
   a. Lithonia
   b. Cooper
   c. Hubbell
2. Lamps: Products of the following, which comply with these specifications, are acceptable.
   a. General Electric
   b. Osram-Sylvania
   c. Philips

C. Verification: Verify with fixture manufacturers that scheduled fixture descriptions and catalog numbers are in agreement and complete, and that fixtures are furnished with the proper trims, frames, supports, hangers, and other miscellaneous appurtenances to properly coordinate with the project requirements as indicated and by actual ceiling systems to be installed.

PART 2 - PRODUCTS

2.1 GENERAL MATERIALS REQUIREMENTS

A. Provide all materials under this section of the specifications.

2.2 MATERIALS DESCRIPTION

A. General:
1. Fixtures shall be listed and labeled by Underwriter's Laboratories (UL) or assembled from UL labeled components.
2. Factory Assembly and Test: Fixtures shall be fully assembled and wired by the factory and ready for installation as shipped.
3. Fixture supports and hardware shall be suitable metal unless otherwise indicated. Support studs used for indoor fixture or component support shall be galvanized steel or malleable iron; diecast studs shall not be used.

B. Ballasts:
1. Ballasts shall be suitable for operation on 60 hertz branch circuits protected at 20 amperes. Ballasts shall be rated for the voltage and circuiting indicated for each fixture type. Generally, fluorescent ballasts shall be high power factor, with sound rating "A", and with class "P" integral thermal protection having automatic reset feature. Ballasts shall be UL labeled.
2. Ballast manufacturer shall warrant ballasts to be free from defects in material or workmanship for at least five (5) years from date of manufacture under normal conditions of use. Any ballast failing within the guarantee period shall be replaced by the manufacturer at no expense to the Owner.
3. Unless otherwise indicated, ballasts for HID fixtures shall be the constant wattage, high power factor, encapsulated typed. Ballasts for outdoor locations shall be designed for cold starting at -20^{o}C. High pressure sodium ballasts shall be auto regulator type with minimum power factor of 0.92.
4. Electronic ballasts shall:
   a. Be provided with documentation showing that manufacturer has at least ten (10) years' experience manufacturing electronic ballasts with a documented failure rate of less than 5 percent of units in service.
   b. Be specifically designed to operate rapid-start T8 lamps, unless otherwise noted.
   c. Be electronic type and operate lamps at a frequency above 20 kHZ from an input of 60 HZ.
   d. Consistently start and operate lamps (with a light output which does not vary) from a supply voltage of plus or minus 10 percent about the center design voltage of 120 or 277 volts.
   e. Provide installed light level equivalent to C.B.M. certified electromagnetic ballast (plus or minus 5 percent).
   f. Be capable of operating remaining lamp(s) if one or more of the companion lamps fail or are removed.
   g. Comply with A.N.S.I. and I.E.E.E. standards for total harmonic distortion (THD). THD shall be less than 20%.
   h. Have input power factor greater than or equal to 92% (.92).
   i. Provide starting sequence consistent with lamp manufacturers' recommendations and provide full rated lamp life.
   j. Have lamp current crest factor (ratio of peak to R.M.S. lamp current) of 1.5 or less per lamp manufacturers' recommendation.
   k. Comply with F.C.C. requirements governing electromagnetic and radio frequency interference.
   l. Comply with I.E.E.E. standards for line voltage transient protection.
   m. Be compatible with occupancy sensors specified, where applied.

C. Lenses: Plastic lenses shall be manufactured and tested to conform with SBC 2604 “Light-Transmitting Plastics & NFPA 101 Chapter 6. Lenses shall meet all of the following:
1. Fall from their mounting at an ambient temperature of at least 200 degree F(93 degree C) below the ignition temperature of the plastic material as measured by ASTM D 1929.
2. Remain in place at ambient room temperature of 175degree F(79 degree C) for a period of not less than 15 minutes.
3. The maximum length of any single plastic panel shall not exceed 10 ft(3048mm) and the maximum area of any single light diffuser shall not exceed 30 sq ft (2.8 sq m)

D. Lamps: Unless otherwise indicated, linear fluorescent lamps shall be rapid-start, T8, 3500K white, CRI of 75 or greater. Compact fluorescent lamps shall be 2700K-3000K white, with tube configuration as indicated. Incandescent lamps shall be coated. Metal halide and high pressure sodium lamps shall be clear, with burning position coordinated with fixture. Metal halide lamps in non-lensed fixtures shall have self-extinguishing feature.

E. Fixtures:
1. Fluorescent:
   a. Fixtures shall be suitable for individual or continuous row installation. Fixtures installed in continuous rows shall maintain nominal spacing.
   b. Fixtures shall be listed and labeled for their intended application on the project. Fixtures shall be suitable for indoor locations, or for outdoor locations where indicated. Fixture housings shall be metal finished with high gloss baked white enamel of 85% minimum reflectance. Reflectors shall be highly specular. Ballasts and wiring shall be totally enclosed. Fixtures for indoor dry or damp locations may have steel or aluminum housings. Fixtures for outdoor or wet locations shall have aluminum or nonmetallic housings.
2. Incandescent:
   a. Fixtures shall be suitable for connection to 120 volts, 60 hertz, single phase distribution systems.
   b. Unless otherwise indicated, recessed mounted incandescent fixtures shall have thermal overload protection to protect against overheating. Fixtures installed in direct contact with insulation shall also be rated for such direct contact.

F. Occupancy Sensors: Occupancy sensors shall:
1. Be motion detectors that provide coverage without gaps within the detection area.
2. Be specifically designed to detect types of motion found in offices, conference rooms, classrooms, bathrooms, etc.
3. Have crystal controlled operating frequency to within 0.005 percent. Sensors shall be available with different operating frequencies to allow individual control of adjacent areas.
4. Have field adjustable controls for "sensitivity" and "time delay." Timing circuitry shall provide user adjustable "time of light off" delay from 0.5 to 12 minutes.
5. Provide constant coverage after sensitivity control has been set.
6. Be U.L. listed.
7. Be provided with an easily visible indicator light to verify that motion is being detected.
8. Be specifically designed for the size of the area in which they will be used.
9. Operate on Class 2 wiring supplied by a switchpack (ceiling mounted units).
10. Operate silently, except when actually switching the load.
11. Withstand the inrush of power required to start the lamp. The sensor shall be designed for use with the ballast supplied.
12. Be provided with a manual override switch in the sensor to allow the load to be turned on without tools in the event of a Sensor failure.
13. Have electronics which shall be replaceable, upon failure, without disturbing the hardwiring or Sensor mounting.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fixtures shall be installed in accordance with UL listing restrictions and local codes and ordinances.

B. Fixtures shall be located in a manner coordinated with any suspended acoustic ceiling pattern, and in accordance with patterns as shown on the Architectural Drawings.

C. In areas of acoustic tile ceiling, centerlines of incandescent and fluorescent fixtures shall coincide with tile centerline or joint, unless otherwise indicated.

D. Lighting fixtures shall be properly and rigidly supported and aligned. Fixtures shall be supported independently of the ceiling support framing, except where framing is not smaller than 1-1/2-inch trade size channel or inverted tee and approval for support of the specific category of fixture is given in writing by the Owner's Representative.

E. Fixture supports shall be standard type bar hangers, or other accepted method. Lay-in type troffers shall be secured to the ceiling support frame by an earthquake clip similar to Caddy #515/515A.

F. Plaster rings shall be provided for recessed fixtures in plastered ceilings of any type.

G. Fixtures above accessible type suspended grid ceilings shall be wired with flexible metal conduit to a nearby junction box. The flexible conduit shall be between four and six feet in length, unless otherwise required by Code.

H. Any fixtures requiring complete installation prior to installation of the ceiling shall be identified by the Contractor and so installed.

I. Verify that only lamp types approved by the fixture manufacturer are installed in fixtures.

J. Verify the final ceiling opening dimensions required as recommended by the manufacturer and shall provide for installation to these dimensions.

K. Verify that fixtures, including wiring and service access methods, are acceptable to the local inspecting authorities having jurisdiction.

L. Fixtures shall have metal parts, glassware, plastic diffusers, etc. free from scratches, chips, cracks, and other defects.

3.2 FIELD QUALITY CONTROL

A. Upon completion of installation of fixtures, and after circuitry has been energized with power source, verify operation of all fixtures, lamps, and associated controls. Correct malfunctioning units, then retest to demonstrate compliance.

END OF SECTION 26 50 00

SECTION 31 2000

EARTHWORK

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Provide labor, material and equipment for excavating, backfilling, filling, grading and related work.

B. Earthwork includes, but is not limited to, excavation, filling, compacting and grading in the areas shown on the drawings to obtain the required finished ground surface properly prepared to receive pavements, walks, building floor slabs, utilities, and drainage structures.

C. The work includes ditching in soil areas of high moisture content to allow the soil to drain prior to making excavations.

D. The work includes adjustment of moisture content up or down by discing of soils placed in fills if soil tests show drying to be necessary to meet compaction requirements.

E. The work includes spreading topsoils in sufficient quantities to backfill islands, medians, and roadway shoulders and open graded areas.

F. The work includes undercutting unsuitable soil materials and replacing with compacted approved soils.

G. The work includes stockpiling approved soil material in convenient location and in sufficient quantity for use in backfill of walls.

H. The work includes removal from the job of unsuitable, excess materials if pre-approved by Owner.

I. The work includes importing material, if required, from offsite.

1.02 DEFINITIONS

A. "General earth excavation" is defined as follows:
   1. Materials regardless of its nature or composition that can be removed by scrapers, leaders, pans, dozers, backhoes, or graders up to and including that material which requires the use of a single tooth ripper mounted on a crawler tractor having a minimum draw bar pull rated not less than 56,000 pounds. Boulders & Partially Weathered Rock as defined in the geotechnical report are included.

B. “Mass rock”as used herein is defined as follows:
   1. Which cannot be excavated except by drilling or blasting;
   2. Which is hard enough to ring when struck with a hammer, and the amount is greater than one (1) cubic yard of solid stone in volume; and
   3. Which cannot be broken with a heavy single-tooth ripper pulled by the equivalent of a Caterpillar D-8 tractor with a minimum draw bar pull of 56,000 lbs. or by the equivalent of a Caterpillar 977 front end loader.

C. "Trench rock" is defined as follows:
   1. Material which occurs in a utility trench;
   2. Material which is greater than 2 cubic yards in volume; and

3. Which cannot be excavated by the equivalent of a caterpillar 215 backhoe having a bucket curling force of not less than 25,700 lbs.

D. "Muck" is defined as highly organic or plastic material which cannot support fill, footings, slabs, and pavements and requires removal by power shovels or draglines. Excessively wet or dry materials are not considered unsuitable.

1.03 QUALITY ASSURANCE CRITERIA

A. Testing Laboratory
1. The Owner will engage geotechnical engineering services for quality control testing during earthwork operations.

B. Adjacent to buildings and in parking lots and roads, grade to within five hundredths (5/100) of a foot of the elevations and contours shown on the Drawings. In open areas, grade to within one-tenth of a foot of those shown on the Drawings. Hand dress grades under buildings, slabs, walks, and steps to obtain the required elevation as shown on the Drawings.

C. Perform no unauthorized or unnecessary grading. This consists of removal of materials beyond the plan limits of grading and removal of materials beyond indicated subgrade elevation or dimensions without specific direction of the Owner's representative. Provide necessary remedial work at the Contractor's expense.

D. Submit certification by a Geotechnical Engineer that materials imported to the site contain no hazardous substances.

E. Include in the bid submittal unit costs to purchase and place (or perform) as specified on the jobsite the following items.
1. surge stone
2. 57 stone
3. geotextile fabric (stabilization)
4. trench underdrains
5. blasting (mass)
6. blasting (trench)

1.04 SAMPLES

A. Deliver the following samples to testing and inspection service as directed by the Owner:
1. Fifty pound sample of each class fill material encountered as directed by the Geotechnical Engineer using care that samples are representative.
2. Fifty pound sample of proposed fill material.

1.05 SOILS REPORT

A. Obtain a copy of available reports and become familiar with their contents. The Owner makes no assurances as to the contents of the reports. Any claims based on the contents of the reports are disallowed.

1.06 MODULAR RETAINING WALLS

A. Design and construct modular unit retaining walls under the complete and total responsibility of a single entity.

B. Submit to the Owner with the BID a complete design for the walls, including plan view, sections, and elevations, sealed by a registered Structural Engineer licensed to practice in the project jurisdiction. Submit stamped calculations supporting the design, based on the Soils

Report information available. Where additional soils information is needed in order to provide a complete submittal, make whatever tests necessary to acquire adequate information to design the walls.

C. Where walls are installed in cut slopes give particular attention to adequate drainage systems designed to relieve hydrostatic pressure accumulation behind the walls.

D. Submit color and unit type for Owner approval.

E. Warrant the walls and indemnify the Owner against liability related to the design, installation and performance of the walls.

F. Manufacturer:
   1. Acceptable modular unit manufacturers are limited to the following:
      a. Amastone Company
      b. Keystone Retaining Wall Systems
      c. Reinforced Earth Company

G. Retain the services of a Geotechnical Engineer and submit certified documentation that the soils encountered are consistent with soil values used in the wall design. Meet manufacturer's requirements for soils testing.

PART 2 PRODUCTS

2.01 SOIL MATERIALS

A. Definitions:
   1. Satisfactory soil materials consist of soil material that has been submitted to and approved by the Geotechnical Engineer as satisfactory for backfill and fill.
   2. Backfill and Fill Materials: Satisfactory soil materials free of clay, rock or gravel larger than 2" in any dimension, free of debris, waste, frozen materials, organic and other deleterious matter. Provide additional backfill and fill materials from off-site sources as required.
   3. Use soils for structural backfill having a minimum dry density of 97 pounds per cubic foot unless otherwise approved by the Geotechnical Engineer.

2.02 MODULAR UNIT RETAINING WALLS

A. Use units of standard quality, free of chips and cracks, and consistent in color and tone with colors chosen.

B. Remove defective units from the site.

PART 3 EXECUTION

3.01 PROCEDURES

A. After clearing and disposal is complete, strip from the top of the existing ground topsoil in all areas to be graded. Stockpile in approved locations where it will not interfere with building or utility operations. Use topsoils free from subsoil, debris and stones larger than 2" in diameter. Locate stockpiles as designated by the Owner. At the completion of the work, distribute topsoil over the grounds to form a minimum cover of 4 inches loose measure on graded areas to receive vegetation and other areas indicated by the Owner. Scarify subgrade prior to spreading topsoil. Form berms as directed to dispose of excess topsoil and haul off topsoil remaining. Import topsoil to meet the minimum coverage if onsite topsoil is insufficient.

B. Perform exterior grading in accordance with the drawings to ease contours sloping away from the building from sides. In these cases, provide grades of sufficient pitch to drain water from the area.

C. Graded Areas: Repair and reestablish grades to the required elevations and slopes if any settlement or washing occurs prior to the acceptance of the work. Fill to required subgrade levels any areas where settlement occurs.

D. Temporary Grading and Drainage: Provide effective drainage for the entire site.

E. Excavating: Make no footing excavations to the full depth indicated when freezing temperatures or rain is expected. When full depths are reached, protect bottoms from frost or rain if placing of concrete is delayed.
   1. Excavate material of every description and whatever substance encountered, to dimensions and levels shown on the Drawings. Excavate work to be clean-cut and true with bottoms level and sound.
   2. Lab Testing: The Geotechnical Engineer will make necessary tests for required soil bearing values, and soil compaction.
   3. Existing Site Conditions: Excavate any existing depressions or trenches that are encountered and are entirely within the new building walls, or within 5 feet of walls, to solid sub-grade and fill with compacted gravel or concrete to underside of new foundation or floor slab.
   4. Unsuitable Bearing Material: Place the bottom of trenches, foundations and footings and base for paving on compacted suitable material. Remove loose materials, surface vegetation, debris and existing fill before any fill is placed. Proof roll the subgrade in the presence of the Geotechnical Engineer. Fill operations can then take place. Do not place footings until the Geotechnical Engineer and the Owner have examined and approved the soil upon which they will rest. If the bearing capacity at the levels indicated be found by the Testing Laboratory to be insufficient, the Owner may order the excavations carried to proper bearing. Inspect and approve excavations for footings carried deeper than required by error for proper bearing and then fill only with concrete, same as specified for footings, at no additional cost to the Owner. Provide a minimum of six (6) inches compacted crushed #57 stone between bottom of footings and any rock encountered. Compact fill in accordance with requirements for backfill.
   5. Extend excavation, to the depths and dimensions required by the Drawings, including removal of rock.

3.02 ROCK EXCAVATION

A. When rock is encountered, clear away earth and notify the Owner. Owner will inspect material and issue written instructions. Do not excavate rock without written instructions.

B. Blast in accordance with local ordinances, and obtain permits where required by law. Complete blasting before any building footing is poured.

C. Remove excavated rock from the site. Bury as allowed by the specifications.

D. Use rock for rip-rap and erosion control as required by the plans. Meet the specifications for rip-rap.

E. Excavate rock to 6" minimum below bottom of building slabs and footing, pavement, and piping.

F. Measure Rock Excavation as follows:
   1. Mass Rock:
      a. Quantity of rock excavation will be established from cross sections taken by a representative chosen by the Owner. Prior to any rock excavation, expose the rock to be removed which has not been cross sectioned by the Owner's representative or no payment will be made. Prior to payment for rock excavation, the Owner's representative will prepare final cross sections and verify that the rock has been removed to the proper elevation.
      b. Rock removed before measurement will not receive compensation.
      c. Calculate the quantity of rock using the following limits:
         (1) To top of rock;
         (2) To 6" below bottom of base course and 1'-0" beyond edge of paving for uncurbed paved areas;
         (3) To vertical line one foot behind back of curb;
         (4) To 0'- 6" below foundations and footings;
         (5) To vertical faces located 1'-0" horizontal distance from each footing or foundation face;
         (6) To 6" below bottom of slabs on grade;
         (7) To finish grade in cut where rock is removed to finish grade. Where it is not so removed, to the finish rock surface.
         (8) To 1'-0" outside forms for concrete work requiring forms.
         (9) To neat outside dimensions for concrete work with no forms.
   2. Trench Rock:
      a. Measure trench rock by taking level reading at reasonable intervals but not more than ten feet along the exposed trench length before removal of rock.
      b. Rock removed before measurement will not receive compensation.
      c. Calculate the quantity of rock using the following limits:
         (1) To top of rock:
         (2) To vertical faces 1'-0" beyond the outside of pipe barrel, each side;
         (3) To 6" below the pipe barrel for the full trench width;
         (4) To vertical faces 1'-0" horizontal distance beyond structures and manholes;
         (5) To 6" below bottom of slab for structures.

3.03 MUCK EXCAVATION

A. When muck is encountered notify Owner immediately. The Owner or Geotechnical Engineer will inspect the material and issue written instructions.

B. Quantity of muck will be established from taking level reading by a representative chosen by the Owner. Take the readings at reasonable intervals to identify the contours of the area.

C. Muck removed before measurement will not receive compensation.

D. Calculate the quantity of muck by making surveys before and after removal. Base payment on the quantity of muck removed as calculated using the surveys.

E. Stockpile muck on site and reuse as allowed by the Geotechnical Engineer. Remove material which is not reused from the site. Provide settling ponds, dikes, piping, and appurtenances to prevent stockpile runoff from discoloring nearby streams.

3.04 EXCAVATION EMBANKMENT AND BRACING

A. Accept full responsibility for excavations. Protect excavation embankments against collapse. Where possible, make embankments over 5'-0" high at a slope not greater than 2:1 unless a steeper slope is recommended by a Registered Geotechnical Engineer.

B. Where it is not possible to provide a safe environment for slopes, temporarily support banks and maintain securely until permanent support has been provided.

C. Provide cross bracing and shoring to prevent collapse, where ditches or trenches are over 5'-0" deep.

D. Provide bracing systems designed by a Registered Engineer experienced in such designs and acceptable to the Owner. Use the design drawings to show the work and sequence in its entirety and submit to the Owner prior to commencing the work.

E. To prevent caving or settlement of earth adjacent to excavations, and for the protection of persons as well as property, provide shoring, bracing, and other similar material to meet the conditions in each particular case encountered. Leave in place until construction has reached a point where backfills behind walls or in ditches have been made and the need for shoring and bracing has been eliminated.

3.05 FOUNDATION TEST BORINGS

A. The Geotechnical Testing Lab will provide labor and material to drill 2" diameter earth auger borings in foundation trenches for footings to a depth of 6'-0" below bearing. Locate boring and specify quantities as directed by the Owner and do not exceed the equivalent of one boring per 50 linear feet of foundation lines. Use a Registered Geotechnical Engineer to verify the bearing.

3.06 ADDED EXCAVATIONS

A. Should the bearings at the levels indicated be found by the Geotechnical Engineer to be insufficient, the Owner may order the excavations carried to proper bearings. This work may be classified as additional work. Adjust the contract sum as provided for in other divisions.

3.07 FILLING AND BACKFILL

A. Work Included: Include in the contract grading required for subgrade, under floor slabs, paved walks, drives, parking areas and against walls. Construct fills as herein specified.
   1. Structural Fill is defined as fill supporting retaining wall footings or any structure whatsoever and extending for a distance of ten feet (10') on each side of said structure measured at the finished grade, thereafter tapering away at a 45 degree angle.
   2. Paving Area Fill is defined as fill supporting any asphalt, concrete paving, or special paving for parking of cars, or trucks, or concrete walks and extending for a distance of five feet (5')
      on each side of said area measured at the finished grade, thereafter tapering away at a 45 degree angle.
   3. General Area Fill is defined as fill in the general grading area covering banks, lawns, hollows, drainage ditches.

B. Clear and grub vegetation from areas to be filled. Scarify the ground to insure bond between the fill and the original surface. For fill to be placed on hillsides, plow deeply or, where existing ground is steeper than 2:1, bench the existing ground surface before beginning the filling operations.

C. Place fill material in uniform, horizontal layers, not more than 8” thick. Moisten each layer as necessary to insure a proper bond and maximum compaction. Use suitable equipment to mix the material and insure uniform moisture content. Fully and uniformly compact each layer with a sheep’s foot roller or vibratory roller of the proper size and weight to achieve specification.

3.08 PROOFROLLING

A. Contact the Owner's representative and the Geotechnical Engineer at least 48 hours in advance of proofrolling.

B. Clear and strip as herein specified areas to receive controlled structural and paving area fill. After removal of existing structures and topsoil, and before placement of any structural and paving area fill, proofroll that portion of the footing area and paved areas to receive fill to a distance of ten feet (10') beyond the limits. Accomplish proofrolling with a loaded twenty (20) ton minimum dump truck with two (2) complete coverages in each of two (2) perpendicular directions unless otherwise allowed. Accomplish proofrolling under the observation of the Geotechnical Engineer.

C. Undercut up to 6 inches in depth any areas which ‘pump’ under the wheels of the loaded truck and replace with clean, compacted fill, at no cost to the Owner. If pumping continues after the 6 inches of undercutting and backfill, the Geotechnical Engineer will notify the Owner immediately and offer his professional recommendations as to the course of further construction. Undercutting below 6" may be classified as additional work. Adjust the contract sum as provided for in other divisions.

D. Inspect the subgrade areas to receive structural and paving area fill and obtain approval of the Owner before beginning structural fill and parking area fill operations.

E. After filling to rough grade, proofroll as specified above the entire area of the building and paving until areas are approved. After proofrolled areas are approved, undertake excavation for footings.

3.09 BACKFILL AGAINST FOUNDATION WALLS, IN TRENCHES AND EXCAVATIONS, AND OTHER NECESSARY LOCATIONS

A. Do not place backfill against foundation walls until foundation walls are braced and have cured sufficiently to develop the strength necessary to withstand, without damage, the pressures that will result from backfilling and compacting operations. Secure approval of the Owner before commencing backfilling.

B. Placing Backfill: Place al backfill material in uniform, approximately horizontal layers, not exceeding 8" before compacting. Compact each layer with pneumatic tampers or sheepsfoot roller to optimum moisture to produce a minimum of 95% of the standard proctor maximum dry density (ASTM specifications D-698). Use a testing laboratory to perform tests of fill density in place for every lift. Submit reports of tests to the Owner.

C. Surplus Materials: Dispose of excess or unsuitable materials.

3.10 GRADING

A. Place fill as specified for backfill except as noted herein. Accomplish compaction by traversing with a sheepsfoot roller or other approved heavy grading machinery. Compact fill to a minimum of 95% of the standard proctor maximum dry density (ASTM specifications D-698) to 12 inches below subgrade for structural fill areas for a minimum distance of ten feet outside of structure perimeter and for locations for future buildings. Compact parking area fill soils to

95% of the soil's standard density to 12 inches below subgrade. Compact general fill areas to 90% of the standard density.

B. Compact the upper 12 inches of fill in structural fill areas and paving areas to 98% standard proctor density.

C. Preparation of sub-grade for slabs: Remove roots and debris subject to termite attack, rot or corrosion and other material not suitable for fill. Fill holes and minor depressions and compact fillings as specified herein including re-compaction of sub-grade. Place subgrade soils within +/-3% of the soils optimum moisture content per ASTM 698, contain no deleterious material and no rock fragments over 4” (inches) in diameter.

3.11 SITE GRADING

A. Unless otherwise shown on the Drawings, slope the sub-grade evenly to provide drainage away from building walls. Provide berms and swales at top and swales, at bottom of banks, and at other breaks in grade. Grade the finish of the surface to be uniform and smooth and free from irregular surface change. The base of cuts and top edges of fills must be straight and even.

B. Materials: Provide clean, suitable earth for additional fill if a sufficient quantity of suitable material is not available from the required excavation on the site.

C. Grading Operations: Perform cutting, filling, backfilling and grading required to bring the entire project area to sub-grades as follows:
   1. For floor slabs, to underside of concrete slab; for surface area; including driveways, walks and parking area; to the underside of the respective surfacing as fixed by finished grades.

D. Finished Grades: The words "finished grades" as used herein means the required final grade elevations indicated on the Drawings. If finished grades shown by spot elevations conflict with those shown by contours, the spot elevations will govern. Repair areas where settlement, erosion or other deviations occur in the grade. Re-compact and bring to the required section and grades at no additional expense to the Owner.

3.12 MODULAR UNIT RETAINING WALLS

A. Construct walls to clean, straight horizontal and vertical lines in accordance with manufacturer's instructions.

B. Place backfill to meet design specifications.

C. Submit sufficient documentation by the Wall Geotechnical Engineer to show that construction conditions are consistent with design parameters for soils.

D. Mix units to minimize color tone variations in the wall. The Owner may require reconstruction of wall sections where noticeable color variation occurs due to lack of or inappropriate mixing.

3.13 FIELD QUALITY CONTROL

A. Quality Control Testing During Construction: Allow testing and inspection service to inspect and approve subgrades and fill layers before further construction work is performed. Test as follows:
   1. Perform field density tests in accordance with ASTM D-698.

B. Test fill in place by laboratory approved by the Owner. Make tests continuously as necessary during the placing and compacting of the fill. Make tests in fill-in trenches outside of building areas. Obtain approval of fill material by the Testing Lab before it is placed.

C. Test as follows:
   1. Structural Fill and Backfill: Make one test for each two-foot lift of each 2,000 sq. ft. of area.
   2. Paving Area Fill: Make one test for each two-foot lift of each 2,000 sq. ft. of area.
   3. General Area Fill: Make one test for each two-foot lift of each 10,000 sq. ft. of area.

D. Pay for retesting of failed tests.

3.14 PROTECTION OF EXISTING TREES REMAINING

A. Protect tops, trunks, and roots of trees to remain; box, fence or otherwise protect trees which are subject to site work or construction damage. See the Section CLEARING AND GRUBBING for tree protection and removal of any interfering branches. Immediately and properly trim and paint with a protective tree wound and sealing compound any cuts, or accidental injury to the bark or trunk. Remove protection only when danger from operations no longer exists.

3.15 PROTECTION OF ADJACENT PROPERTY

A. For the duration of the construction and until release, protect adjoining property from any excessive drainage and debris. Do not enter upon adjoining property without the permission of the property owner.

3.16 CLEAN-UP

A. During the construction and clean-up, do not dump debris on any part of the property or in any unauthorized place. Remove debris, construction material, equipment, logs, stumps, boulders, or any other extraneous material deposited during construction from the site. Remove existing debris or other extraneous material from undisturbed areas. Material that is removed from the site is the property of the Contractor.

END OF SECTION

SECTION 31 2320

GROUNDWATER CONTROL

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Provide labor, material, and equipment for groundwater control.

B. Groundwater control includes construction and procedures required to remove excessive groundwater that is encountered in subgrades and soils to be excavated.

C. Temporary groundwater control consists of trenching, pumping, dewatering and draining of groundwater as required to advance the work.

D. Permanent groundwater control, if required, consists of providing a permanent system of underdrains and filters as shown on the drawings or as directed by the Owner.

1.02 QUALITY ASSURANCE

A. Notify the Owner for inspection of trenches prior to construction of underdrains and backfill.

B. The Owner will inspect completed underdrains prior to backfilling.

PART 2 PRODUCTS

2.01 UNDERDRAIN MATERIALS

A. Filter cloth for underdrains: Pervious sheet of synthetic non-woven polymer filaments. Use filter cloth type recommended by its manufacturer for the intended application. The filter cloth specification is subject to the Owner's approval.

B. Stone: #57 washed crushed stone drainage fill meeting ASTM C33.

2.02 PERVIOUS BACKFILL

A. Stone: #57 washed crushed stone pervious backfill.

2.03 UNDERDRAIN PIPE

A. Pipe: PVC perforated pipe meeting ASTM D3034, SDR35, perforation conforming to ASTM C-758.

PART 3 - EXECUTION

3.01 GENERAL

A. Employ temporary groundwater control wherever wet soils are encountered in subgrades and in soils to be excavated.
   1. In soils to be excavated, maintain a system of ditches ahead of the work to allow the soil to drain. Construct ditches of the number and depth required to allow free-draining of the soil. Provide means of removing the water from ditches. This work is incidental to the grading operation.
   2. In paving subgrade areas, excavate ditches excavated below subgrade only if approved by the Owner.
   3. Handle groundwater in utility trenches in accordance with generally accepted practice as incidental work. Include drainage fill and dewatering as required.

B. If required, provide permanent groundwater control of underdrains, filters, blanket drains, and

chimney drains.

1. Provide permanent groundwater control in the locations and in accordance with the details shown on the drawings, or as directed by the Owner.
2. Ditching in wet, unstable soil conditions is incidental to the work.

3.02 UNDERDRAINS

A. Construct underdrains in accordance with the details shown on the drawings, or as directed by the Owner.

B. Lay pipe, where specified, true to line and grade to show a full circle of light when lamped.

C. Provide access to ends of pipe at changes in grade and direction to allow inspection and flushing of underdrains after partial or complete backfilling.

D. Flush and inspect underdrain pipe prior to final closure.

E. Lay filter fabric for underdrains in a trench and fold back to allow drainage fill and pipe, to be inserted. Compact the drainage fill. Lap the fabric sides across the top of the gravel a minimum of 12 inches. Repair any rips or tears in the fabric by lapping a separate fabric section 12 inches beyond the tear in each direction.

F. Carefully place and compact backfill to prevent damage or movement of filter cloth.

END OF SECTION

SECTION 31 2520

EROSION SEDIMENTATION AND POLLUTION CONTROL

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Provide labor, material, and equipment for temporary and permanent management practices as shown on the plans, as contained in the Erosion, Sediment, and Pollution Control Plan (ESPCP), and as directed by the Owner during the life of the Contract to control erosion, storm water runoff, and pollution through the use of berms, dikes, dams, sediment basins, fiber mats, netting, mulches, grasses, slope drains, temporary silt fences, and other management practices.

B. Coordinate temporary erosion control provisions with permanent erosion control features to assure economical, effective, and continuous erosion, sedimentation, and pollution control throughout the construction and stabilization period.

C. Management practices required are not limited to the measures shown on the plans. Provide additional practices necessitated by actual conditions and methods.

D. Silt and pollution leaving the site and any effects of the release are the sole and total responsibility of the Contractor as Primary, Secondary or Tertiary Permittee or Operator.

E. Provide Subcontractors with a copy of the ES & PC Plan. Post notices requiring Subcontractors to review and comply with the ES & PC Plan.

1.02 RELATED DOCUMENTS

A. Conform to the Georgia Water Quality Act, the Federal Clean Water Act, the rules and regulations promulgated to each of these Acts and the Georgia NPDES General Permit No. GAR 100000.

B. Conform, at a minimum, to the "Manual for Erosion and Sediment Control in Georgia" (MESCG), latest edition, published by the Georgia Soil Conservation Service (MESCG).

C. Maintain a copy of the MESCG on site throughout construction.

1.03 DEFINITIONS

A. Refer to the Georgia NPDES General Permit and the Manual for Sediment Control in Georgia for a complete list of definitions.

B. The partial list of definitions is provided for the Contractor’s convenience only. Obtain copies of the reference documents and learn appropriate terms required to fully implement the ES & PC Plan.

C. Terms Defined:

1. Best Management Practices (BMPs): schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of Georgia. BMPs include treatment requirements, operating procedures, and practices to control site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.
2. Comprehensive Monitoring Plan (CMP): The plan for monitoring of turbidity in receiving waters or outfalls.

3. Final Stabilization: soil disturbing activities at the site have been completed for unpaved areas and areas not covered by permanent structures, at least 70% of the soil surface is uniformly covered in permanent vegetation or equivalent permanent stabilization measures (the use of rip rap, gabions, permanent mulches or geotextiles). Permanent vegetation: planted trees, shrubs, perennial vines; a crop of perennial vegetation appropriate for the time of year and region; or a crop of annual vegetation and a seeding of target crop perennials appropriate for the region, so that within the growing season a 70% coverage by perennial vegetation shall be achieved. Final stabilization applies to each phase of construction. For linear construction projects on land used for agricultural or silvicultural purposes, accomplish final stabilization by stabilizing the disturbed land for its agricultural or silvicultural use.
4. General Contractor: the operator of the common development or site.
5. Nephelometric Turbidity Unit (NTU): a numerical unit of measure based upon photometric analytical techniques for measuring the light scattered by fine particles of a substance in suspension.
6. NOI: Notice of Intent.
7. NOT: Notice of Termination.
8. NPDES: National Pollution Discharge Elimination System.
9. Operator: the entity that has the primary day-to-day operational control of those activities at the facility necessary to ensure compliance with Erosion, Sedimentation and Pollution Control Plan, Comprehensive Monitoring Program requirements and permit conditions.
10. Primary Permittee: the Owner and the Operator of a tract of land for a common development, or of a stand-alone facility that is not part of a common development; or a utility company when it is the only entity conducting a construction activity on a piece of property.
11. Qualified Personnel: a person who has successfully completed an erosion and sediment control short course eligible for continuing education units, or an equivalent course approved by EPD and the State Soil and Water Conservation Commission.
12. Sediment: solid material, both organic and inorganic, that is in suspension, is being transported, or has been moved from its site of origin by, wind, water, ice, or gravity as a product of erosion.
13. Waters of Georgia or Waters of the State: rivers, streams, creeks, branches, lakes, reservoirs, ponds, drainage systems, springs, wells, wetlands, and other bodies of surface or subsurface water, natural or artificial, lying within or forming a part of the boundaries of the state which are not entirely confined and retained completely upon the property of a single individual, partnership, or corporation.

1.04 QUALITY ASSURANCE CRITERIA

A. Project Review: Prior to the preconstruction conference, review in detail the ES & PC Plan.

B. Preconstruction Conference: At the preconstruction conference submit for acceptance a detailed schedule for accomplishment of temporary and permanent erosion control work and installation of BMPs, for clearing and grubbing, grading, structures at watercourses, construction, paving and other job activities. Submit for acceptance a proposed method of erosion control for haul roads and borrow pits and a plan for disposal of waste materials. Do not start work until the erosion control schedules and methods of operations have been accepted by the Owner.

C. Provide qualified personnel to supervise provision and maintenance of management practices.

PART 2 PRODUCTS

2.01 Silt Fence

A. Filter Fabrics:
   1. Synthetic Fabric: Use filter fabric composed of strong rot-proof synthetic fibers formed into a fabric of either woven or non-woven type. Use fabric free of any treatment or coating which might significantly alter its physical properties. Use fabric containing stabilizers or inhibitors to make the filaments resistant to deterioration resulting from exposure to sunlight or heat. Use a pervious sheet of synthetic fibers oriented into a stable network so that the fibers retain their relative position with respect to each other. Finish the edges of the fabric to prevent the outer yarn from pulling away from the fabric. Use fabric free of defects or flaws which significantly affect its physical and/or filtering properties. Use fabric with a minimum width of 36 inches. Sew or bond sheets of fabric together. No deviation from any physical requirements will be permitted due to the presence of the seam.

B. Posts: Straight steel posts, 1.33 pounds per linear foot min., 5 feet long, at 4 feet max. o.c., 1-3/4 inches wide, which have projections for fastening the wire to the fence.

C. Woven Wire Fence: Wire fence fabric at least 32 inches high, with at least 6 horizontal wires. Vertical wires spaced 6 inches apart. Top and bottom wires at least 10 gage. Other wires at least 14 gage.

D. Wire staples: Wire No. 9 staple at least 1 ½ inches long.

E. MESCG: Meet MESCG regulations, Type C Application, per Table6-20.5.

2.02 Downdrains and Storm Drain Pipes:

A. Downdrains: HDPE Pipe or Corrugated Plastic Pipe per the Section STORM DRAINAGE.

B. Storm Drains: Per the Section STORM DRAINAGE.

2.03 Stone:

A. Rip Rap: Quarried solid stone showing no quarrying marks, minimum size per the plans.

B. Stabilization Stone: Cleaned, crushed stone, #57, meeting Georgia Dept. of Transportation specifications.

2.04 Concrete:

A. Portland Cement, minimum 3000 psi compressive strength at 28 days.

B. Course aggregate crushed stone meeting ASTM C33.

2.05. Mats and Blankets:

A. Jute or Hemp Mat: Woven, 76 to 80 warpings per 4 foot width, 39 to 43 weftings per 3 foot length, 0.9 pounds per square yard minimum, 1.5 pounds per square yard maximum.

B. Excelsior Blanket: 80% of fibers 6” min. length, smolder resistant, photo-degradable plastic mesh, maximum 1-1/2 x 3 inches, ¼ inch min. thickness, 0.8 pounds per square yard.

C. Coconut Fiber Blanket: 100% coconut, ¼” min. thickness, 48” min. width, 0.5 pounds per square yard, photo-degradable plastic mesh 5/8” x 5/8” maximum.

D. Wood Fiber Blanket: Free of germination inhibitors, photo-degradable plastic mesh, 5/8" x ¾" max. spacing, 0.35 pounds per square yard minimum dry weight.

2.06 Polymers:

A. Anionic polyacrylamide soil binding agents, environmentally benign, 0.05% monomer by weight.

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Install management practices in accordance with the ES & PC Plan, the MESCG, and the NPDES General Permit.

B. Maintain management practices throughout construction and until the site is finally stabilized.

C. Implement or assist the Owner with implementation of the Comprehensive Monitoring Program.

D. Submit reports as required by the local jurisdiction, state, and federal government.

E. Retain records as required by the NPDES General Permit.

F. Submit or assist the Owner with submittals of the Notice of Intent and Notice of Termination.

3.02 LIMITS OF CONSTRUCTION

A. The Owner has the authority to limit the surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow and fill operations. Provide immediate permanent or temporary erosion control measures to prevent contamination of adjacent watercourses, lakes, ponds, other water impoundments and other waters of the State. Such work may involve the construction of temporary berms, dikes, dams, sediment basins, slope drains, and use of temporary mulches, mats, seeding, or other control devices or methods as necessary to control erosion. Seed and mulch cut and fill slopes as the excavation proceeds to the extent shown on the ES & PC Plan and as directed by the Owner.

B. Incorporate all permanent management practices into the project at the earliest practicable time as outlined in the activity schedule. Use temporary management practices to correct conditions that develop during construction; that are needed prior to installation of permanent pollution control features; or that are needed temporarily to control erosion that develops during normal construction practices, but are not associated with permanent control features on the project.

C. Schedule and perform clearing and grubbing operations so that grading operations and permanent management practices can be installed before or immediately thereafter; install management practice between successive construction stages as needed.

D. The Owner may limit the area of excavation, borrow and embankment operations in progress commensurate with the capability and progress of the Contractor in keeping the finish grading, mulching, seeding, and other such permanent management practices current in accordance with the schedule.

E. Under no conditions is the amount of surface area or erodible earth material exposed at one time by excavation or fill within the project area to exceed 750,000 square feet without the prior written approval of the Owner.

F. The Owner may increase or decrease the amount of surface area or erodible earth material to be exposed at one time by clearing and grubbing, excavation, borrow and fill operations as determined by his analysis of project conditions.

G. In the event of conflict between these requirements and erosion, sedimentation and pollution control laws, rules, or regulations or other Federal or State or local agencies, the more restrictive laws, rules, or regulations apply.

3.03 CONSTRUCTION OF STRUCTURES

A. Temporary Berms:
   1. Construct a temporary berm of compacted soil, with a minimum width of 24 inches at the top and a minimum height of 12 inches with or without a shallow ditch, constructed at the top of fill slopes or transverse to centerline on fills. Grade temporary berms so as to drain to a compacted outlet at a slope drain. The area adjacent to the temporary berm in the vicinity of the slope drain must be properly graded to enable the inlet to function efficiently and with minimum ponding.
   2. Extend transverse berms required on the downstream side of a slope drain across the grade to the highest point at approximately a 10-degree angle perpendicular to centerline. When practical and until final elevations are approached, construct embankments with a gradual slope to one side of the embankment to permit the placement of temporary berms and slope drains on only one side of the embankment.

B. Temporary Slope Drains
   1. Use temporary slope drains consisting of stone gutters, fiber mats, plastic sheets, concrete or asphalt gutters, half-round pipe, metal pipe, plastic pipe, flexible rubber, or other materials which can be used as temporary measures to carry water accumulating in the cuts and on the fills down the slopes prior to provision of permanent facilities or growth of adequate ground cover on the slopes.
   2. Do not use fiber matting and plastic sheeting on slopes steeper than 4:1 except for distances of 20 feet or less.
   3. Adequately anchor temporary slope drains to the slope to prevent disruption by the force of the water flowing in the drains. Compact and concavely form the base for temporary slope drains to channel the water and hold the slope drain in place. Properly construct the inlet end to channel water into the temporary slope drain. Construct energy dissipators, sediment basins, or other devices at the outlet end of the slope drains to reduce erosion downstream. Remove temporary slope drains when no longer necessary and restore the site to match the surroundings.

C. Sediment Control Structures
   1. Utilize sediment control structures to control sediment at the foot of embankments where slope drains outlet; at the bottom as well as in the ditchlines atop waste sites; in the ditchlines or borrow pits. Use sediment control structures in most drainage situations to prevent excessive siltation of pipe structures. Use sediment structures at least twice as long as they are wide.
   2. When the use of temporary sediment control structures is discontinued, remove sediment accumulation and excavation backfill and properly compact. Restore the existing ground to its natural or intended condition.

D. Check Dams:
   1. Utilize check dams to retard stream flow and catch small sediment loads.
   2. Key check dams into the sides and bottom of the channel a minimum depth of 2 feet.

E. Temporary Seeding and Mulching
   1. Perform seeding and mulching in accordance with the drawings and specifications.

F. Brush Barriers
   1. Use brush barriers consisting of brush, tree trimmings, shrubs, plants, and other approved refuse from the clearing and grubbing operation. Construct the brush barriers approximately parallel to original ground contour. Compress the brush to an approximate height of 3 to 5 feet and approximate width of 5 to 10 feet. Do not support the embankment by the construction of brush barriers.

G. Baled Hay or Straw Erosion Checks
   1. Embed hay or straw erosion checks in the ground 4 to 6 inches to prevent water flowing under them. Anchor bales securely to the ground by driving wooden stakes through the bales into the ground. Retain bales in place until they rot. Remove after final stabilization if so directed by the Owner. Keep the checks in good condition by replacing broken or damaged bales immediately after damage occurs. Normal debris clean-out is considered routine maintenance.

H. Temporary Silt Fences
   1. Place temporary silt fences on the natural ground, at the bottom of fill slopes, or other areas as shown or needed.
   2. Maintain the silt fence in a satisfactory condition for the duration of the project. Distribute the silt accumulation at the fence to conform to the grading plan. Remove silt fence from the site after final stabilization.

3.04 MAINTENANCE

A. Maintain temporary management practices until no longer needed or permanent management practices are provided and the site is stabilized. Remove temporary materials.

B. In the event that temporary management practices are required due to negligence, carelessness, or failure to provide permanent management practices as a part of work as scheduled, provide at no cost to the Owner.

C. When silt deposited in sediment basins occupies more than 30% of the basin capacity, remove the silt. Remove the silt from the site unless otherwise permitted by the Owner. Restore the basin to the conditions and grades as shown on the Drawings.

3.5 EROSION CONTROL OUTSIDE PROJECT AREA

A. Use temporary management practices for construction work outside the project area.

END OF SECTION

SECTION 31 3116

SOIL TREATMENT

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Provide labor, material, and equipment necessary to apply soil treatment as required.

1.02 SUBMITTALS:

A. Submit manufacturer's technical data indicating chemical to be used, installation instructions and copy of container label.

1.03 QUALITY ASSURANCE:

A. Engage a professional pest control operator, licensed in accordance with regulations of governing authorities for application of soil treatment solution.

B. Use only termiticides which bear a Federal registration number of the U.S. Environmental Protection Agency.

1.04 JOB CONDITIONS:

A. Scheduling:
   1. Make application during normal working hours.
   2. Allow not less than 12 hours for drying after application, before covering treated area.

B. Post signs in areas of application, warning that soil treatment has been applied. Remove signs before treated areas are covered by other construction.

1.05 WARRANTY:

A. Submit written warranty certifying that applied soil termiticide treatment will prevent infestation of subterranean termites for the warranty period listed.

B. Warrant effectiveness of treatment for period of five years with warranty cost included in contract sum. Use a warranty in the form of an insurance policy, written in the amount specified by the Owner, for damage to building and contents.

C. State dates of application and chemicals used, including quantities and concentrations on the warranty.

D. Contain in the warranty a clause allowing the Owner to renew on a year-to-year basis at the end of the five year period at Owner's option, for a fee to be agreed upon at time of renewal by Owner.

E. Re-treat upon evidence of subterranean termite activity at no charge to the Owner.

PART 2 PRODUCTS

2.01 MATERIALS

A. Emulsible concentrate: Termiticide for dilution with water, specially formulated to prevent infestation by termites. Do not dilute with fuel oil.

B. Use termiticides registered by the Environmental Protection Agency for their intended use. Use termite treatment accepted by the U.S. Department of Agriculture for use in controlling termite infestation of buildings, without being injurious to plant life.

C. Mixtures of chemicals are prohibited, except as premixed from manufacturer.

PART 3 EXECUTION

3.01 APPLICATION:

A. Surface Preparation: Remove foreign matter which could decrease effectiveness of treatment on area to be treated.

B. Under slab-on-grade structures: Treat soil before concrete slabs are placed, using the following methods of application:
   1. Application rates: Apply termiticide in accordance with manufacturer's label instructions and EPA requirements for subterranean or surface treatment.
   2. Apply chemical solution to soil at interior side of foundation wall, at both sides of interior partition walls, around plumbing pipes, electrical conduit, interior column footings, and slab penetrations.
   3. Apply chemical solution as an overall treatment under slab and attached slab areas. Perform no treatment when soil is wet or frozen. Avoid flow of termiticide from treated surfaces.
   4. Apply chemical solution along outside edge of building. Dig a trench 6" to 8" wide along outside of foundation to a depth of 12" minimum. Punch holes to top of footing at 12" o.c. and apply chemical solution. Mix chemical solution with soil as it is replaced in trench.

C. Reapply soil treatment solution to areas disturbed by subsequent excavation or other construction activities following application.

END OF SECTION

SECTION 32 1620

CONCRETE CURBS, GUTTERS, AND WALKS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Provide labor, material and equipment required to complete curb and gutter, sidewalks, and other miscellaneous site improvements, including preparation of subgrade for areas and backfilling and shaping of finished grade.

1.02 QUALITY ASSURANCE

A. Submit design mixes when requested for each type of concrete. Use an independent testing facility acceptable to the Owner for preparing and reporting proposed mix designs.

B. Provide drawings, schedules and details for the fabrication of the reinforced steel. Complete drawings and details so that when used with the contract drawings, the reinforcing steel can be placed.

C. Store materials and equipment only in designated areas.

D. Do not begin concrete operations until underground work of other trades has been completed.

E. Verify grades and elevations before proceeding with the work. While grades and elevations will, in general, conform to those shown on drawings, the Owner reserves the right to make minor modifications by reasonable field adjustments prior to completion of subgrade work.

PART 2 PRODUCTS

2.01 MATERIALS

A. Concrete:
   1. Use 3,000 psi concrete, 4" maximum slump unless otherwise shown on drawings, for aprons, curbs and gutters, and walks and steps.

B. Filler and Sealer for Expansion Joints: preformed strips of cellular fiber impregnated with suitable bituminous binder. Filler to conform to section area and extend through section to within one-half inch (½") of top surface and to meet Federal Specifications HH-F-341(A) Type l.

C. Reinforced Bars: ASTM A615-04 with Supplement S1, Grade 60.

D. Formwork: Square-edged, finished one side lumber, plywood, metal or other material acceptable to the Owner. Comply with ACI Standard Recommended Practice for Concrete Formwork.

E. Curing compounds: Meeting ASTM C309-03, Type 1.

F. Colored Admixture for Integrally Colored Concrete: CHROMIX P® Admixture and CHROMIX ML®; L.M. SCOFIELD COMPANY.

1. Admixture shall be a colored, water-reducing, admixture containing no calcium chloride with coloring agents that are limeproof and ultra-violet resistant.
2. Colored admixture shall conform to the requirements of ACI 303.1, ASTM C979, ASTM C494 and ASSHTO M194.
3. Acceptable manufacturer or equivalent: L.M. SCOFIELD COMPANY, Douglasville, Georgia and Los Angeles, California (800) 800-9900 or the appropriate local contact: Eastern Division – 201-672-9050; Western Division – 714-568-1870; Central Division Office – 630-377-5959.

PART 3 EXECUTION

3.01 GENERAL

A. Provide formed concrete as detailed on the plans. Accurately form cast-in-place concrete to a true, clean, straight, even profile.

B. Form curb and gutter to line grades indicated. Lay out radii with curved formwork. Place walk expansion joints at 50'-0" maximum and contraction joints at every 10'-0" on center. Provide expansion joints at curve intersections.

C. Place concrete walks, aprons and pavement to the grades and dimensions shown on the drawings. Place walk expansion joints at a maximum 50'-0" spacing. Space contraction joints at dimensions equal to the walk width. Slope surfaces a minimum 1/8" per foot to prevent puddling or ponding of water.

D. Form cast-in-place retaining walls to the details shown on the drawings, able to hold the weight of wet concrete without deflection.

3.02 CONCRETE MIXING

A. Ready-mix Concrete: Comply with the requirements of ASTM C94-03.

B. During hot weather or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C94-03 may be required.

C. When the air temperature is between 85F and 90F, reduce the mixing and delivery time from 1 ½ hours to 75 minutes, and when the air temperature is above 90F, reduce the mixing and delivery time to 60 minutes.

3.03 PLACING OF CONCRETE

A. Do not place concrete until embedded items and reinforcement have been placed in forms and the approval of the Owner has been obtained. Give ample notice to the Owner of an impending pour so that he may inspect work prior to placing.

B. Convey concrete from mixer to place of final deposit by methods that will prevent segregation or loss of material.

C. Deposit concrete as nearly as practicable to its final position. Carry on pouring at a rate that concrete is plastic and flows readily into spaces between reinforcement. Once started, continue placing as a continuous operation until placement of the section is completed.

D. Work concrete into forms, around bars and embedded items with spades, rods, trowels and vibration, so as to procure a solid homogeneous mass, free of pockets, voids and honeycombs.

E. Use construction joints made and located so as to least impair the strength of the structure. Where a joint is made, clean surface of the concrete and remove laitance. Mechanically

roughen vertical joints, wet and slush with a coat of neat cement grout immediately before placement of new concrete.

F. When hot weather conditions exist that would seriously impair the quality and strength of concrete, place concrete in compliance with ACI 305-99. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90F. Mixing water or used chopped ice to control the concrete temperature provided. Calculate the water equivalent of the ice into the total amount of mixing water. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that the steel temperature will not exceed the ambient air temperature immediately before embedment in concrete. Do not use retarding admixtures without the written approval of the Owner.

3.04 FINISHING OF CONCRETE

A. Broom finish surfaces of aprons, curb and gutters, and drainage flumes in accordance with ACI 303-97.

B. Smooth rub finish exposed surfaces of cast-in-place retaining walls in accordance with ACI 301-99.

3.05 CURING OF CONCRETE

A. Spray surfaces with a curing compound as soon as forms are removed and finishing is completed.

3.06 TESTING OF CONCRETE

A. Perform one slump test, ASTM C143-03 for each concrete load at point of discharge, and prepare one set of three standard compressive strength cylinders, ASTM C31-03 for each 100 cubic yards or fraction of concrete placed in any one day. Store compressive strength cylinders in damped protective material for pick up and use by the Testing Lab. The expense of transportation and testing of cylinders is included in the work.

3.07 REPLACING DAMAGED CONCRETE

A. Do not spot patch concrete walks, curb and gutters, and site improvements damaged during construction. If a portion of a panel or section is damaged between tooled or expansion joints, replace the entire section.

END OF SECTION

SECTION 32 9200

TURF AND GRASSES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Provide labor, material, and equipment necessary to prepare soil, sod and seed lawns, mulch and water lawns and grasses.

1.02 QUALITY ASSURANCE

A. Sod: Comply with American Sod Producers Association (ASPA)classes of sod materials.

B. Upon request, provide and pay for materials testing by testing agency acceptable to the Owner. Provide the following data:
   1. Test representative material samples proposed for use.
   2. Topsoil:
      a. pH factor.
      b. Mechanical analysis.
      c. Percentage of organic content.
      d. Recommendation on type and quantity of additives required to establish satisfactory pH factor and supply of nutrients to bring nutrients to satisfactory level for planting.

C. Before proceeding with any work, verify dimensions and inform the Owner of any discrepancies between the drawings and specifications and actual conditions.

1.03 SUBMITTALS

A. Upon request, submit seed vendor's certification for required grass mixture, indicating percentage by weight, and percentages of purity, germination, and weed seed for each grass species.

B. Upon request, submit sod growers certification of grass species.

C. Upon request, submit the following material samples:
   1. Seed.
   2. Sod

D. Upon request, submit the following material certification:
   1. Fertilizer(s) analysis.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver seed and fertilizer materials in original unopened containers, showing weight, analysis, and name of manufacturer. Store in a manner to prevent wetting and deterioration.

B. Cut, deliver, and install sod within a 24-hour period.
   1. Do not harvest or transport sod when moisture content adversely affects sod survival.

2. Protect sod from sun, wind, and dehydration prior to installation.
3. Do not tear, stretch, or drop sod during handling and installation.

1.05 PROJECT CONDITIONS

A. Prepare ground surface and soil as specified, to slopes and final grades shown on drawings and necessary for drainage.

B. Work notification: Notify Owner at least 48 hours prior to start of seeding and sodding operations.

C. Protect existing utilities, paving, and other facilities from damage caused by seeding and sodding operations.

D. Perform seeding and sodding work only after planting and other work affecting ground surface had been completed.

E. For new lawn areas and existing lawn areas to be completely renovated, weeds, grass, and other plants are to be killed removed completely prior to soil preparation.

F. Restrict traffic from lawn areas until lawns and grasses are established. Erect signs and barriers as required.

G. Provide hose and lawn watering equipment as required.

1.06 WARRANTY

A. Provide a uniform stand of grass by watering, mowing, and maintaining seeded and sodded areas until final acceptance. Reseed or resod areas, with specified materials, which fail to provide a uniform stand of grass until affected areas are accepted by the Owner.

PART 2 PRODUCTS

2.01 MATERIALS

A. Lawn seed: Fresh, clean, and new crop seed mixture.

MIXTURE	PURITY	MINIMUM GERMINATION	CONDITION
Bermuda	97%	85%	Hulled, Coated
Fescue	97%	85%	Coated
Rye	97%	85%	Coated

Sod type: Late May to September - Certified Bermuda Sod (Cynodon dactylon Hybrid)
Late September to April - Festuca arundinacea Fescue

2. Furnish sod machine stripped and of Supplier's standard width, length, and thickness: Uniformly 1" to 1-1/2" thick with clean cut edges. Mow sod before stripping.

C. Fertilizer:

1. Granular, non-burning product composed of not less than 50% organic, slow acting, guaranteed analysis professional fertilizer.
   a. Starter fertilizer: (Type A) Fescues and Bermudas: 8% N - 24% P - 10% K (by weight)
   b. Top dressing fertilizer: (Type B) Fescues and Bermudas: 10% N - 10% P - 10%K

D. Straw Mulch: Clean oat, wheat or fescue straw, well seasoned before baling, free from seed-bearing stalks, or roots or noxious weeds, finely ground.

E. Wood cellulose fiber mulch: Degradable green dyed wood cellulose fiber or 100% recycled long fiber pulp, free from weed or other foreign matter toxic to seed germination and suitable for hydro mulching.

F. Water: Free of substance harmful to seed growth. Furnish hoses or other methods of transport.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine finish surfaces, grades, topsoil quality, and depth. Do not start seed and sodding work until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. Limit preparation to areas which will be immediately seeded or sodded.

B. Loosen topsoil of lawn areas to minimum depth of 4". Remove stones over 1" in any dimension and sticks, roots, rubbish, and extraneous matter.

C. Grade lawn areas to a smooth, free draining even surface with loose, moderately coarse texture. Roll and rake, remove ridges, and fill depressions as required to drain.

D. Apply Type A fertilizer at the rate equal to 1.0 lb. of actual nitrogen per 1,000 sq. ft. (12.5 lbs./1000 SF or 545 lbs./acre). Apply fertilizer by mechanical rotary or drop type distributor, thoroughly and evenly incorporated with the soil to a depth of 3" by discing or other approved method. Fertilize areas inaccessible to power equipment with hand tools and incorporate it into soil.

E. Dampen dry soil prior to sodding.

F. Restore prepared areas to specified condition if eroded, settled, or otherwise disturbed after fine grading and prior to sodding.

3.03 INSTALLATION

A. Seeding for turf (lawn) areas
   1. Seed immediately after preparation of bed:
      Bermuda: April 15 to August 31
      Rebel II Fescue: September 1 to November 15 and April 15 to May 15.
      Rye (temporary): November 15 to April 15.

2. Seed indicated areas within contract limits and areas adjoining contract limits disturbed as a result of landscape construction operations.
3. Perform seeding operations when the soil is workably dry and when winds do not exceed five (5) miles per hour velocity.
4. Apply seed with a rotary or drop type distributor. Sow seed evenly in equal quantities in two (2) directions, at right angles to each other.
5. Sow fescue grass seed at the rate of 6 lbs. / 1000 SF or 275 lbs/acre. Sow Bermuda grass seed at the rate of 2 lbs. / 1000 SF or 90 lbs. / acre.
6. After seeding, rake or drag surface of soil lightly to incorporate seed into top 1/8" of soil. Roll with light lawn roller.
7. Apply seedless, finely ground wheat or fescue straw mulch to fescue seeded areas, sufficient to cover but not more than 1/2" thick so as not to smother germinating grass. Do not mulch bermuda grassed areas more than ¼" thick.
8. Water the seeded area after completing seeding operations. Do not allow soil surface to dry out after beginning to water for at least 30 days. This may require watering more than once a day.

B. Sodding
1. Lay sod to form a solid mass with tightly-fitted joints. Butt ends and sides of sod strips. Do not overlay edges. Stagger strips to offset joints in adjacent courses. Remove excess sod to avoid smothering of adjacent grass. Provide sod pad top flush with adjacent curbs, sidewalks, drains, and seeded areas.
2. Do not lay dormant sod. Do not place sod on saturated or frozen soil.
3. Place initial row of sod in a straight line, beginning at bottom of slopes, perpendicular to direction of the sloped area. Place subsequent rows parallel to and lightly against previously installed row.
4. Peg sod on slopes 3:1 and greater to prevent slippage at a rate of 2 stakes per yd. of sod.
5. Water sod thoroughly with a fine spray immediately after laying.
6. Roll with light lawn roller to ensure contact with sub-grade.

3.04 MAINTENANCE

A. Maintain seeded lawns until completion and acceptance of the entire project.

B. Maintain seeded lawn areas, including watering, spot weeding, mowing, application of herbicides, fungicides, insecticides, and re-seeding until a full, uniform stand of grass free of weeds, undesirable grass species, disease, and insects is achieved and accepted by the Owner.

1. Water to maintain adequate surface soil moisture for proper seed germination. Continue daily or more frequent watering if needed for not less than 30 days. Thereafter apply adequate amount of water to maintain until acceptance.
2. Repair, rework, and re-seed areas that have washed out, or are eroded. Replace undesirable or dead areas with new seed.
3. Apply Type B fertilizer to lawns approximately 30 days after seeding at a rate equal to 1.0 lb. of actual nitrogen per 1,000 sq. ft. (10 lbs. / 1000 SF or 430 lbs. / acre). Thoroughly water into soil.

C. Maintain sodded lawns until completion and acceptance of the entire project.

D. Maintain sodded lawn areas, including watering, spot weeding, mowing, application of herbicides, fungicides, insecticides and resodding until a full, uniform stand of grass free of weed, undesirable grass species, disease, and insects is achieved and accepted by the Owner.
   1. Water sod thoroughly every 1 to 2 days, and as required to establish proper rooting.
   2. Repair, rework, and resod areas that have washed out or are eroded. Replace undesirable or dead areas with new sod.
   3. Apply Type B fertilizer to lawns approximately 30 days after sodding at a rate equal to 1.0 lb. of actual nitrogen per 1,000 sq. ft. (10 lbs. / 1000 SF or 430 lbs. / acre). Apply with a mechanical rotary or drop type distributor. Thoroughly water into soil.

E. Mow fescue lawn areas as soon as lawn top growth reaches a 3" height. Cut back to 2 ½" height. Mow Bermuda lawn areas as soon as top growth reaches a 2" height. Cut back to 1-1/2" height. Repeat mowing no less than once every seven days as required to maintain specified height. Do not cut off more than 30% of grass leaf at any single mowing. Mow Bermuda with a reel mower. Remove grass clippings.

F. Apply herbicides per manufacturer's recommendations as required to control weed growth or undesirable grass species.

G. Apply fungicides and insecticides per manufacturer's recommendations as required to control diseases and insects.

3.05 ACCEPTANCE

A. Inspection to determine acceptance of seeded lawns will be made by the Owner, upon your request. Provide notification at least 48 hours before requested inspection date.
   1. The Owner will accept seeded areas provided requirements, including maintenance, have been complied with, and a healthy, uniform, close stand of the specified grass is established free of weeds, undesirable grass species, disease, and insects.
   2. No bare or eroded spots, or thin, sparce cover totaling more than 2% of the individual areas, in areas inspected, will be accepted.

B. Upon acceptance, the Owner will assume lawn maintenance.

C. Inspection to determine acceptance of sodded lawns will be made by the Owner. Provide notification at least 48 hours before inspection date.
   1. The Owner will accept sodded areas provided requirements, including maintenance, have been complied with, and a healthy, even colored, viable lawn is established, free of weeds, undesirable grass species, disease, and insects.
   2. Loose, ragged edges or un-rooted strips and patches will not be accepted.

3.06 CLEANING

A. Perform cleaning during installation of the work and upon completion of the work. Remove from site excess materials, debris, and equipment. Repair damage resulting from sodding and seeding operations.

END OF SECTION 32 9200

SECTION 32 9300

PLANTS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Provide labor, material, and equipment necessary to install trees and shrubs, groundcovers and appurtenances.

B. Visit the site and become familiar with existing conditions. Accept final rough grades prior to commencing finished grading.

C. Provide finish grades as shown on plans and as required to achieve positive drainage of landscape beds away from building and sidewalks and toward drainage structures.

1.02 DRAWINGS AND SPECIFICATIONS

A. Drawings and Specifications prepared for this project by the Owner are a part of the contract as are any duly authorized and issued addenda to the Drawings and/or Specifications.

B. Materials shown on Drawings and/or Specification but not necessarily included in both are required as though included in both. Provide materials shown on Drawings, whether noted or not. Immediately notify the Owner of any discrepancies between plans and planting lists.

1.03 EXPERIENCE

A. Perform work specified in this document with personnel experienced in the planting and maintenance of lawns, trees, shrubs, and ground cover and adequate equipment and resources to perform the work specified herein. Do not work when the ground is frozen, too wet or under other unfavorable conditions.

1.04 APPROVAL AND SELECTION OF MATERIAL AND WORK

A. The selection of materials and the execution of operations required under the specifications and drawings are subject to the approval of the Owner who has the right to reject any materials and any work which, in his opinion, does not meet the requirements of the Contract Documents during any stage of construction. Remove rejected materials from the site.

1.05 SUBMITTALS

A. As a condition of the Contract, provide unit prices for plant materials as described in the itemized Bid Form, attached to the end of this section. Unit prices will be used by the Owner to make adjustments to the Landscaping.

B. Provide the Owner with two (2) complete bound copies of written instructions for the prescribed maintenance of the landscaping, as a condition for final acceptance.

1.06 ACTIVE UTILITIES

A. There may be active utilities located within the limits of work. Before commencing any work required under the contract, locate utilities, subsurface drainage, and underground construction so that proper precautions are taken not to disturb or damage any subsurface improvements. Make repairs to damaged utilities resulting from the work covered by this contract at no cost to the Owner.

1.07 LAYOUT WORK

A. Before any lawn or planting is begun, stake out work in accordance with the plan. Call to the attention of the Owner and clarify any discrepancies.

1.08 PROTECTION OF ADJACENT PROPERTY

A. For the duration of the construction and until contract release, protect adjoining property from any excessive drainage and debris from the site.

B. Grass disturbed areas, unless otherwise shown.

1.09 TEMPORARY FACILITIES

A. Erect signs only with permission of the Owner.

1.10 PROTECTION AND CLEAN UP

A. Keep existing streets, driveways, and walks free from debris and mud during construction.

B. Protect site drives, curbs, walks, slabs and equipment from damage by machinery or personnel during execution of the work.

C. Upon completion of the project, remove temporary structures, materials, equipment, and debris. Sweep and wash clean concrete walks and other hard surface areas.

PART 2 PRODUCTS

2.01 PLANT MATERIAL

A. Agency Standards: Use plant material true to name and size and in conformity with the following standards:
   1. American Standard for Nursery Stock ANSI Z60.1-1996, Copyright 1997, (Published by the American Association of Nurserymen, Inc. 1250 I Street, NW, Suite 500, Washington, D.C., 20005).

B. Plant List: A complete list of plants, including a schedule of quantities, sizes and other requirements is shown on the Drawings. In the event that discrepancies occur between the quantities of plants indicated in the plant list and as indicated on the plan, the plan governs.

C. In sloped areas, contractor is responsible for adjusting quantities to maintain fall coverage of areas at

specified plant spacing.

D. Substitutions: No substitutions will be accepted in size or type, except with the written permission of the Owner. Upon submission of written proof that a plant is not obtainable. Procure a change order, without increase in contract price, if authorized by the Owner, providing for use of nearest equivalent size or variety of plant having same essential characteristics.

E. Quality and Size
   1. Use nursery grown plants, freshly dug or grown in containers of size specified for a minimum period of three months prior to purchase, normally shaped, and well branched, with full foliage when in leaf and healthy, well-developed root systems, self-supporting, with straight trunks and with leaders intact. Use plants free of injuries and bruises, insect infestations or their eggs.
   2. Use plants true to species and variety. Measure before pruning, with branches in normal position. Do necessary pruning only at the time of planting. Meet requirements for the measurements, branching, grading, quality, balling, and burlapping of plants in the plant list following the code of standards currently recommended by the American Association of Nurserymen, Inc., in "American Standard for Nursery Stock".
   3. Use balled and burlapped plants containing in the ball as much undisturbed soil, and as many fibrous roots as possible. Secure and tightly wrap root and soil with burlap and hold the burlap in place with cord. Handle balled and burlapped plants in a manner which will neither loosen the ball nor damage the plants. Plants having loose earth balls will be rejected.
   4. No heeled in plants, or plants from cold storage will be accepted, except upon written approval of the Owner. Match plants used where symmetry is required as nearly as possible. Substitute only with written permission from the Owner.

F. Measurements
   1. Conform to size and grading standards of the American Association of Nurserymen unless otherwise specified. Dimension a plant as it stands in its natural position. Provide stock of a fair average between the minimum and maximum size specified. Large plants which have been cut back to the specified size will not be accepted.
   2. Measure the height and spread of plants and height of the tree trunk to foliage line with the branches in their normal positions. Measure the caliper of trees six inches above the surface of the ground.
   3. Provide plants larger than specified in the Plant List at no additional cost if approved by the Owner. Increase the diameter of the ball and spread of the roots proportionately.

2.02 TOPSOIL

A. If topsoil is necessary for planting of lawns and groundcover beds in excess of that available on the site, import natural, fertile, friable soil possessing characteristics of representative productive soils in the vicinity.

B. Use topsoil free from subsoil, gravel, hardpan, Japanese beetles, fire ants, and white fringed beetles; and reasonably free from clay lumps, debris of every description, stones, rocks larger than one inch in any dimension, roots longer than 6” or larger than ½ inch in diameter, toxic amounts of acidic and alkaline substances, and other substances which would interfere with mixing, planting, and maintenance.

2.03 PLANTING SOIL FOR SHRUBS AND TREES

A. Use soil consisting of 1/3 excavated parent soil dug for shrubs and trees, cleaned of debris and stockpiled, 1/3 Peat Moss or Compost, and 1/3 dark organic Sandy Clay loam. Blend thoroughly. Stockpile this material and clean of gross debris. Break large chunks into granular size.

2.04 PEAT MOSS

A. For annual areas, use imported Canadian Sphagnum Peat Moss, or Pine Bark Humus, brown, low in content of woody material, and free of mineral matter harmful to plant life. Peat moss to have an acid reaction of about 4.0 to 5.0 pH. Thoroughly pulverize and moisten peat moss before use.

2.05 MULCH

A. Use pinestraw free from noxious weed seed, fire ants and Japanese beetles, and sticks, that is clean, dry, and freshly baled, not rotten or crumbly

2.06 LIME

A. For grassed areas only, use ground Dolomitic limestone not less than eighty five percent (85%) total carbonates and magnesium. If necessary, broadcast Limestone on the areas to be planted, to correct the pH range of the soil for proper plant and grass growth.

2.07 COMMERCIAL FERTILIZER

A. Use Commercial Fertilizer of the type of fertilizer produced for annuals, shrubs and trees. Apply fertilizer according to manufacturer's specifications.

Annuals	Osmocote	14-14-14
Shrubs	Osmocote	14-14-14
Trees	Agriform	14-14-14
Groundcover	Agriform	14-14-14

2.08 WATER

A. Provide the water required for the execution of work including maintenance until work under this contract has been completed.

2.09 MATERIALS FOR GUYING AND WRAPPING

A. Use ground anchors for anchoring guy wires of four inch (4") stamped iron, #3 steel rebar or solid, undecayed wood stakes as shown in details.

B. Use double strands of twelve (12) gauge, pliable, galvanized steel wire or, woven polypropylene material, white in color, flat, ¾” wide for guys, or for fastening trees to stakes. Arbortie or approved equal will also be accepted.

C. Hose to encase guy wires : 2 ply reinforced rubber garden hose, not less than one-half inch (½")

diameter, new or used, black in color. Arbortie or approved equal will also be accepted.

2.10 HERBICIDE

A. Use Herbicides approved by the Owner. The Landscape Contractor is responsible for any damage or cost incurred from herbicide use.

PART 3 EXECUTION

3.01 FINE GRADING

A. Prior to the Landscape Contractor's involvement, prepare rough grades to meet the specifications, uniformly leveled, and positive drainage provided with abrupt changes in slopes rounded off. The Landscape Contractor is responsible for fine grading related to landscape installation.

B. Loosen the subgrade soil to a depth of six inches (6") and grade to remove ridges and depressions so that it will be everywhere parallel to the prepared finished graded. Remove stones over two inches (2") in dimension, sticks, rubbish and other extraneous matter during this operation. Do not move heavy objects except lawn rollers over the lawn areas after the subgrade soil has been loosened and prepared as specified. Where topsoil is stockpiled for spreading, spread topsoil over the lawn areas adjacent to the new building and pavement and compact with no object heavier than lawn rollers on top of prepared subgrade.

C. Fine grade throughout the site. Assure drainage away from the building and into the drainage structures. Hand grade and shape disturbed areas and areas to be planted. Maintain surfaces to indicated finished grades and grade to take care of any settlement.

3.02 PREPARATION OF PLANTS

A. In preparing plants for moving, take precautions customary in good trade practice. Workmanship that fails to meet industry standards will not be accepted. Dig plants to retain as many fibrous roots as possible. Dig plants immediately before moving unless otherwise specified.

B. Use balled and burlapped, "B&B", plants having a solid ball of earth of minimum specified size held in place securely by burlap and a stout rope. Oversize or exceptionally heavy plants are acceptable in size if the ball or spread of the roots is proportionately increased to the satisfaction of the Owner. Broken, loose, or mutilated balls will be rejected.

C. Container-grown plants: Provide container grown plants with well established root systems sufficient to hold earth together after removal from container, but not root bound, grown for at least three (3) months in container with inside diameter designated in Schedule of Plant Materials.

3.03 DELIVERY

A. Pack, transport and handle plants with utmost care to insure adequate protection against injury. Water plants prior to shipping and do not allow to dry out.

3.04 STORAGE OF MATERIALS

A. Cover balls of "B&B" plants and containers of container grown plants which cannot be planted immediately upon delivery with moist mulch to protect from drying. Plant or heel in plants immediately upon delivery. Water plants as often as necessary to prevent drying until planting.

3.05 INSPECTION

A. Do not plant any plant material until it is inspected and approved by the Owner at the site of the project. The Owner is the sole judge of the quality and acceptability of the materials. Remove rejected material immediately from the site and replace with acceptable material at no additional cost.

3.06 WRAPPING AND GUYING DETAILS

A. Materials used in wrapping, guying protection, specified herein.

3.07 PLANTING OF TREES, SHRUBS AND GROUNDCOVERS

A. Time of Planting: Start planting when other divisions of this work including placing of topsoil to finished grade, has progressed sufficiently to permit planting. In open areas, finished grade is defined as being within one tenth (1/10) of one foot of those grades shown on the grading plans. Exercise caution not to disturb or damage existing lawn areas. Thereafter, conduct planting operations under favorable weather conditions during the next season or seasons which are normal for work as determined by accepted practice in the locality of the project. Conduct planting operations under unseasonable conditions without additional compensation.

B. Layout: Locate planting where it is shown on the plan except where obstructions overhead or below ground are encountered or where changes have been made in construction. Prior to the excavation of planting area or plant pits, or placing tree stakes, ascertain the location of utility lines, electric cables, sprinkling systems, and conduits so that proper precautions are taken not to disturb or damage any sub-surface improvements. When obstructions are found, promptly notify the Owner who will arrange to relocate the plant material. Obtain approval by the Owner for necessary adjustments.

C. Setting Plants
   1. Plant each plant in an individual hole as specified for trees, shrubs, and ground covers. Dig holes with straight vertical sides and flat bottoms, or as directed. Dig the hole width for shrubs and trees a minimum of twice the diameter of the root ball, depth 6" deeper than the root ball, and loosen subgrade at the bottom of the hole an additional 6” depth. Scarify th sides of the hole.
   2. Remove containers and loosen roots before setting container-grown plants in holes.
   3. Set plants so that when settled, they will bear the same relation to the required finished grades as they bore to the natural grades before transplanting. Plant each plant in the center of the pit. Set plants plumb and brace rigidly in position until the planting soil has been tamped solidly around the ball of roots. Do not stomp on root balls to straighten or settle the plant. Do not place soil over the top of the roots or around the trunk collar of trees.
   4. Remove ropes, wires and stakes from the top 1/3 of the root ball before filling in, unless otherwise directed by the Owner. Properly cut burlap ropes, and strings and remove from the top of the ball. When depth is specified, measure depth below finished grade.
   5. Do not fill around trunk or stems.

D. Backfilling of Planting Pits and Planting Beds
   1. Place excavated parent soil stockpiled from shrubs and tree holes back in the holes. Lightly tamp and water this soil so as to remove air pockets. If augers are used for hole digging, scar the side of these holes with a shovel. When the pit is nearly filled, water thoroughly and allow water to soak away. If settling of the backfill occurs after watering, add more backfill to bring to level. Form a shallow saucer around each plant by placing a ridge of topsoil around the edge of each pit.

   2. Fertilizer: For annuals and ground cover areas, mix fertilizer into soil when soil is loosened. For shrubs and trees, mix fertilizer into excavated parent soil.

E. Planting Trees: Plant trees before surrounding smaller plants and groundcovers are in place. Position trees as indicated on the drawing. Where spacing dimensions or locations are not clear, notify the Owner before installation.

F. Planting Shrubs: Plant on centers as indicated with quantities adjusted if necessary to evenly fill bed using specified spacing of plants.

G. Planting Groundcovers: Plant in beds having a minimum of eight inch (4") depth of prepared soil mixture. Prepared soil mixture to consist of 75% topsoil thoroughly mixed with 25% organic mulch (ground pine bark with particles 1/4" and smaller in size) ten pounds of 5-10-5 fertilizer per 1000 square feet and work into soil mixture. Rake beds smooth. Clear rocks and other debris. Space plants as indicated on plan. In case of insufficient quantity, notify the Owner. Mulch and water immediately after planting.

H. Mulching: Within two days after planting, place a layer of commercial pinestraw minimum three inches (3") thick on the finished grade about plants. Completely cover shrub beds with a similar material.

I. Smooth planting areas to conform to specified grades after full settlement has occurred and prior to application of mulch.

J. Guying, Staking: Support trees immediately after planting. Support trees as shown in details or another method preferred by the Contractor, first approved by the Owner. Stand plants plumb after staking in accordance with the detail drawings.
   1. Guying: Use three (3) guys equally spaced as shown on detail for trees over two (2) inches in caliper.

K. Watering: Thoroughly water each plant immediately following planting. Water as needed for the time period covered by guarantees.

L. Pruning and Repair: Prune plants neatly as instructed to preserve the natural character of the plants and in a manner appropriate to the particular requirements of each plant, and to the satisfaction of the Owner. Remove broken or badly bruised branches with a clean cut. Use sharp tools for pruning in accordance with instructions of the Landscape Architect. Promptly treat accidental damage to trees and shrubs

occurring during the course of planting operations which is not so great as to necessitate removal of a branch or replacement of a plant as required in accordance with recognized horticultural practices and the instructions of the Owner.

3.08 MAINTENANCE

A. Repair and maintain guy wires upon completion of planting and to the end of the guarantee period. Guy wires are not to be tight. Maintain 1" slack minimum to allow trees to have the ability to move in windy conditions. Inspect the project monthly during the guarantee period and immediately notify the Owner of any irregularities or deficiencies which will affect his guarantee. Submit in writing recommended changes to the maintenance to the Owner.

B. Reset any plants to upright position or to proper grade, and remove and replace any dead plant material.

C. Protect planting areas and plants against trespassing and damages of any kind for the duration of the maintenance period. If any plants become damaged or injured, treat or replace as directed by the Owner at no additional cost to the Owner. Do not work within, adjacent to, or over any plant or planting area without proper safe-guards and protection to the plant material. If planting is performed after grass area preparation, provide proper protection to grass areas and repair any damage resulting from planting operations as necessary at no cost to the Owner.

D. Keep sidewalks, streets, and other paved areas clean when planting and maintenance operations are in progress.

3.09 GUARANTEE

A. Guarantee plants to remain alive and healthy for one year and any replacements for an additional one year beginning at the time of replacement. The one year guarantee period shall begin at the date of final owner acceptance.

3.10 INSPECTION FOR BEGINNING THE GUARANTEE PERIOD

A. The Owner will inspect the planting work to determine its completion for beginning of the guarantee period upon notice requesting inspection at least three (3) days prior to the anticipated date. Planting must be alive and healthy in order to be considered complete. Upon acceptance of the work in total, the responsibility of the Landscape Contractor for maintenance exclusive of replacement will be terminated unless the maintenance agreement is accepted by the Owner.

3.11 FINAL INSPECTION AND REPLACEMENTS

A. Final inspections will be made at the conclusion of the guarantee period by the Owner. No plants will be accepted unless they are alive and healthy. Replace any plants which are dead, or, in the opinion of the Owner, are in an unhealthy or unsightly condition, and/or have lost their natural shape due to dead branches at no cost to the Owner.

END OF SECTION 32 9300

SECTION 33 4646

SUBDRAINAGE SYSTEMS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Provide labor, material, and equipment for the installation of subsurface drains, filter fabric, stone.

1.02 SAMPLES

A. Submit samples of pipe, tubing, filter fabric and stone upon request of the Owner.

PART 2 PRODUCTS

2.01 PIPE

A. Use perforated or slotted PVC pipe for drains meeting ASTM-F-758 in sizes shown on the plans.

B. Use flexible corrugated polyethylene tubing for transitions meeting ASTM-F-405.

2.02 STONE

A. Use clean crushed Stone, #57, meeting the requirements of Georgia Department of Transportation Specifications.

2.03 SAND

A. Where specified on the plans, use sand as a backfill aggregate. Conform to ASTM C33.

2.04 FILTER FABRIC

A. Use synthetic filter fabric, non-biodegradable, inert to soil chemicals in the range of pH of 3 to 12, with a minimum grab tensile strength of 125 pounds.

B. Use filter fabric Mirafi 140N, or equal.

2.05 DETECTION TAPE

A. Where PVC Pipe is installed, place metallic detection tape in the pipe trench no less than 18" and no more than 24" below finish grade atop pipe.

B. Meet pipe manufacturer's specification.

PART 3 EXECUTION

3.01 GENERAL

A. Install drains to conform to typical sections shown on the plans.

3.02 PIPE

A. Lay pipe true to line and grade within the stone and fabric filter with a minimum of 3" of stone surrounding the pipe, with tees, elbows and fittings to provide a continuous, uninterrupted drain system. Use open joint or push-on joints as required by the pipe manufacturer. Check perforations for clearance and open prior to installation.

B. Visually inspect pipe as the work progresses, to assure a clean passageway.

C. After completion of pipe laying and interconnections and prior to final covering, flush lines with clean water to remove debris.

3.03 FABRIC

A. Place and overlay fabric as detailed on the plans.

B. Install fabric in accordance with manufacturer's instructions.

3.04 BACKFILL

A. Backfill in trenches in a manner to prevent segregation of the stone during unloading operations.

B. Place stone to prevent ripping or tearing of the filter fabric to depth of the pipe bedding.

C. Place #57 stone by hand work around and above the drain pipe to the depth shown on the plans before completing the backfill.

END OF SECTION